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15TH YEAR OF PUBLICATION

MODEL AIRPLANE NEWS

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Cover Design, Jo Kotula

Managing Editor
Robert McLarren
Advertising Mgr.
Jay P. Cleveland
Production Mgr.
Joseph M. Mann
Associate Editor: H. E. Burns
Asst. Adv.: A. M. Hoffman

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FLASH

EXPERTS SAY that the remains of the *Luftwaffe* is being overhauled and that experienced pilots are going through training school again. Reason is that bomber pilots by the thousands are being made over into fighter pilots because of greater need for defensive air soldiers to combat the growing Allied bomber might and because of the virtual demise of the German bombardment force . . . opposite number is the increasing conversion of A.A.F. fighter pilots to bomber jobs, a switch that requires a 6-week retraining course to "slow down" the highly-tuned bodies and minds of fighter pilots for the slower but far more destructive bomber piloting tasks.

PIONEER GLIDER pilot and expert Richard C. Dupont, who was killed in a glider crash last September, has been awarded the Distinguished Service Medal posthumously for his work with the A.A.F. as advisor on gliding training, piloting and tactical use. . . . Those Liberators that attacked Jaluit Island in the Jap-held Marshalls flew 4,400 miles nonstop from Hawaii and all returned safely to complete a record-breaking trip . . . airbase on bloody Tarawa in the Gilberts cuts this distance to little over 700 miles round trip. . . . Henry Ford has models of his post-war transports which he will build "to create jobs for the people who will need them." . . . Ford announces that more than 1,000 Liberators took off from Willow Run last year and this does not include those shipped out unassembled. The next thousand will come awfully fast!

THE NAVY has cancelled contract for *Buccaneer* scout-bombers from Brewster Aeronautical upon agreement with owner-manager Henry J. Kaiser who will center firm's efforts on volume output of Vought-designed *Corsair* carrier-fighters. . . . Bell Aircraft has cut out 10-hour shifts because the long day worked hardships on 58% of its direct labor: women with household responsibilities.

THREE BLASTS, of mysterious house-shattering proportions, rocked London in a single week without slightest prop hum of enemy being registered by radio locators. The frightened yelled: "Secret weapon!" but government spokesmen insisted: "Gas mains." . . . Sweden reports startling new German twin-engine long-range fighter being groomed for the Battle of the French beaches, a Messerschmitt product with 2-ton load capable of round-trip to Scotland. . . . Russia claims 53,000 German planes buried in Red countryside in last 28 months. . . . With British loss put at 47,000 killed and 63,000 wounded, bomb tonnages on Berlin indicate more than 350,000 casualities to the super-race.

UNSHAKEN FAITH in lighter-than-air craft is professed by Rear Admiral Charles E. Rosendahl, holder of Navy Cross for outstanding action in command of carrier, a job he had to take to earn his promotion. . . . Uncle Sam's new fighter-bomber made its debut over Germany late last November which also brought the *Airacobra* to the Mediterranean theatre for the first time. No news on new plane will be released until it is taken *intact* by the enemy. . . . The reason for the Eighth's raid on Knaben, Norway, was the molybdenum plant there. This critical element, although weighing more than iron, is widely used in aircraft steels to increase strength and hardness.

JACK FROST has become an axis partner—it is thought that icing of carburetors, air intake ducts, wings and control surfaces downed as many Allied bombers on the Berlin saturation raids as enemy flak. . . . In the early days of Henderson Field any pilot returning without bullet holes in his plane was considered a sissy. In that area pilots are forbidden to fight alone, if avoidable, because they are far more effective fighting in pairs. "Don't be a blasted hero. We may need your plane tomorrow" is the permanent order of the day. . . . Airplane engines and propellers have zoomed from $1.00 per pound to more than $8.00 but the price increase comes nowhere near meeting the terrific increase in efficiency in these vital units of Air Power.

PESSIMISTIC TALK about the future collapse of the aircraft industry pervades many cloak rooms. *Flash News* points out that Uncle Sam is going to remain a very good customer from now on for there is never to be another Pearl Harbor! . . . The newly conceived National Clinic of Domestic Aviation clashed in Oklahoma City six hundred strong. When the free-for-all cleared on the third day a unanimous endorsement of the "Secretary of National Defense" cabinet post was agreed. This is to include under-secretaries for Army, Navy and Air. . . . When Chennault's men raided Formosa they bagged 20 bombers, 8 fighters, a transport and a German dive-bomber!

WHEN GENERAL ARNOLD saw the Boeing superbomber he said: "I saw an eyeful." When emperor Hirohito sees the same sight he's going to get an eyeful! . . . When the *Ruhr Express*, Canada's first heavy bomber, was dishing it out over Berlin the tail-gunner noticed a Focke-Wulf shining in the glare of a dozen searchlights and watched spellbound as Nazi flak tore it to pieces. . . . Army announced that 125,000 wounded have been air evacuated in this war. . . . Grumman is using Barbara Jayne, Elizabeth Hooker and Mrs. Teddy Kenyon as

(Continued on page 62)

Office of War Information—

PERFORMANCE OF U

In the opinion of Army and Navy aviat combat surpass ene

THE test of battle—the only valid test of the performance of combat aircraft—has by now resulted in a number of box scores which reveal the pattern of accomplishment of American combat planes. Box scores in our favor are not a new development, resulting from superiority in numbers of planes in combat theaters. Although superiority in numbers has by now been established on many fronts, it is in China, where we still have many fewer planes than the enemy, that one of the highest box scores has been made.

"In every theater of operations, American airmen and American planes have met the challenge of our enemies and out-fought them by scores never worse than two to one in our favor," said General Henry H. Arnold, Commanding General of the Army Air Forces. "All types of American fighter planes have shot out of the skies the best interceptors both Germany and Japan have put against them." This has been true since January, 1942, when our planes were out-numbered on practically all fronts. The latest box scores follow. They are not selected. They are *the* box scores, up to September 1, made up of combat reports coming in from every corner of the world.

From December 7, 1941, (Pearl Harbor) to September 1, 1943, American Army combat planes flew a total of 223,758 sorties in which they dropped a total of 105,649 tons of bombs. On those missions our Army planes destroyed 7,312 enemy planes, probably destroyed an additional 2,196 and damaged an additional 2,535. Their own loss in aerial combat was 1,867 American planes. For the six months ending September 1, 1943, our planes destroyed 5,389 enemy planes, probably destroyed an additional 1,502, damaged an additional 1,860, against a loss of 1,239 American planes in aerial combat. The box score by plane types shows that among Army planes the heavy bombers have the best record. From January 1 to June 30 of this year Army heavy bombers destroyed 1,333 enemy planes against a loss of their own of 316 ships, a little better than four to one. Army medium bombers during that same period destroyed 113 enemy planes against a loss of 69, almost two to one in our favor. During that same period Army fighters destroyed 763 enemy planes against a loss of 375 of their own planes, slightly better than two to one. Over Sicily, Sardinia and Southern Italy, during the four weeks of action ending July 28th, the Eighth and Ninth Air Forces dropped 12,460 tons of bombs and destroyed 342 enemy planes, plus 54 "probables," at the cost of 190 American planes.

On August 6th, Major-General Claire L. Chennault announced at the headquarters of the 14th Air Force in China that during the 13 months from July 4, 1942, when the United States took over from the American Volunteer Group, to August 4, 1943, 442 enemy planes were destroyed with the loss of 51 American planes—a score of almost 9 to 1. This ratio does not include 166 Japanese planes claimed as "probably" destroyed. General Chennault announced that during July 41,000 tons of enemy shipping was sunk by the 14th Air Force and 35,000 tons damaged. The Navy, which does not announce long-term box scores, is nevertheless of the opinion that enemy plane losses to date stand at "four or five times" the number of American planes lost. The first ten days of this summer's North Solomons offensive brought a score of 199 to 34 in our favor, with 16 of our pilots saved. On one day, June 30, the Japanese lost 101 planes to our 14.

But box scores do not, of course, tell the full story. A plane which destroys a strategic bridge, or a group of tanks, or a ship, or an enemy industrial plant, adds testimony to the excellence of our aircraft performance which no box score can include. This additional destruction wrought by our planes, although less precisely measurable, especially on a comparative basis, than results of fighting between plane and plane, is of fundamental importance. The accuracy of American daylight precision bombing has become a by-word. The outstanding demonstration of this excellence of our bombing equipment, strategy and combat crews in this type of operation was the first raid on the Rome railway yards on July 19, when 272 heavy and 249 medium bombers dropped 1,101 tons of bombs. Also remarkable were the destruction of the harbors of Tunis, Ferryville and adjoining cities, where, although devastation fell on shipping and installations day after day, all portions of the cities apart from the harbor quarters were unscathed. Airfields in Sicily, too, were accurately blasted, leaving adjoining buildings untouched.

Enemy bombers apparently are far less numerous than ours, and no enemy bombing remotely rivals ours either in intensity or accuracy. The effectiveness of precision-bombing in destroying important industrial targets and installations is estimated by the Army Air Forces to be several times that of night area bombing. Area bombing is saturation bombing of an entire area as against bombing specific targets within an area (precision bombing).

Photographic reconnaissance, by American combat planes and fliers, is proceeding on a large scale. The complete photographing of Sicily before the invasion unquestionably saved many lives that might have been expended had our landings been blind. Development of negatives is remarkably swift, prints being available within an hour after the reconnaissance plane has returned to base. Our planes have also played an important part in the effective war against submarines. Land-based Vega *Venturas*, Consolidated *Catalinas*, and *Liberators*, and Grumman *Avengers* and Grumman *Wildcats* based on auxiliary carriers and carrying depth-bombs, are joined by blimps working out from our and foreign coasts in a ceaseless patrol, a never-ending watch over convoys and escort vessels.

Navy patrol and carrier based planes accounted for 21½ of the 90 enemy submarines sunk during May, June and July. (The one-half submarine is explained by the fact that in the case of that sub two Navy planes, crippled the craft and Navy destroyers finished it off.) Planes from Navy escort carriers, Grumman *Avengers* as torpedo bombers and Grumman *Wildcats* as fighters, played a major part in the occupation of Attu and did effective work in the landings in Africa.

There is no getting away from the fact that the box scores, plus the other, less calculable accomplishments in destruction, prove that at the present time our combat planes and our airmen are superior to the planes and airmen of the enemy. They prove that the vast air force which America has built up is

. COMBAT PLANES

perts, American-built planes now in anes in every major class

suited to the global nature of the war, that it is powerful, balanced, adapted to the variety of strategic and tactical tasks imposed upon it.

In an earlier report on combat aircraft, published by OWI in October, 1942, before there was so much battle experience to draw upon, it was stated that "The best the public can expect, and the best it will get, is that on the average the equipment of the Allied air forces shall be superior to the equipment of the enemy." An officer in the Material Command of the Army Air Forces, to whom this statement was recently read, replied: "That is certainly the case now, and in a very big way." And General Arnold, in his May report, stated: "We are well on our way to maintaining clear-cut aerial supremacy in all nine theaters of operation." The Army Air Forces have the following to say about the combat planes which have chalked up the scores in America's favor:

"All planes have definite deficiencies for any given operation. When the enemy has the initiative he may select the altitudes at which to press his attacks. Being alert and intelligent, he has selected those air combat levels at which his aircraft have their greatest margin of performance over our own. Such tactics are possible because no airplane, friendly or enemy, can be designed to have superior performance at all altitudes. At the points where the United States has taken the air initiative, the box score—always in our favor—has risen to a most gratifying figure."

The following is a catalogue of the chief combat planes which have run up the high scores in our favor, together with additional mention of newer types.

U. S. ARMY AIR FORCES

Pursuit

After a somewhat unpromising start, Army fighters are now among the world's best. Here, speed, climb, and firepower are the qualities being stressed. A new Bell fighter, a greatly improved version of the P-39 *Airacobra*, now in production, is to have an improved rate of climb and ceiling. The new *Merlin*-powered *Mustang* is built for high altitude and high speed. The improved P-38's and P-47's are both being given higher horsepower, resulting in faster rate of climb and greater range. In addition to these, the A-20 night bomber is now in operation. An entirely new single-engine fighter of greatly advanced performance is being built. Fighters are being increasingly employed as light attack airplanes. They have been considerably used for low-level bombing in the Sicilian campaign. V-type liquid-cooled engines are found in most fighter models because the long, slender shape of a liquid-cooled engine is more adaptable to streamlined fighter design. It allows better vision, and has a smaller frontal area for the same horsepower. But it will be noted that in the P-47, where 2,000 horsepower was desired, an air-cooled engine was used.

Republic P-47 *Thunderbolt*

The newest fighter at present in combat, the P-47, has been currently rolling up a score of approximately four to one in its contests with Messerschmitts and high-flying Focke-Wulfs over England, France and the Low Countries. Armed with eight .50 caliber machine-guns, and heavily armor-plated, it is capable of flying over 400 miles an hour and of reaching an altitude of 40,000 feet. This "huge, streamlined milk bottle," as it has been called, is the only Army fighter to be equipped with a turbo-supercharged 2,000 horsepower air-cooled *Double Wasp* engine (Ford-built Pratt & Whitney); the size of this great power plant is apparent from the plane's silhouette. Additional horsepower is being provided in newer models to increase the plane's rate of climb and to give it still greater speed. It is generally considered the world's best single-engine fighter for high-altitude operations.

On July 30, P-47's supporting B-17's bombing Kassel in Central Germany shot down 25 Nazi fighters with a loss of six. On September 25, P-47's gave fighter protection to Fortresses on an 800 mile flight to Emden. It was the first time that our bombers received fighter escort on such a long trip from English bases.

Lockheed P-38 *Lightning*

The latest model of this fast, powerful fighter has been given greatly increased horsepower in its Allison engine, improved pilot's vision, and improved inter-cooling for better high-altitude performance. It out-performs the Zero and later Jap fighters at all altitudes. The F-5A, a version of the P-38, is the plane used by the Army Air Forces for photographic reconnaissance. Equipped with cameras instead of guns, it ranges over enemy territory at low or high altitude as desired, to bring back pictures of terrain and installations, or of damage inflicted by bombing raids.

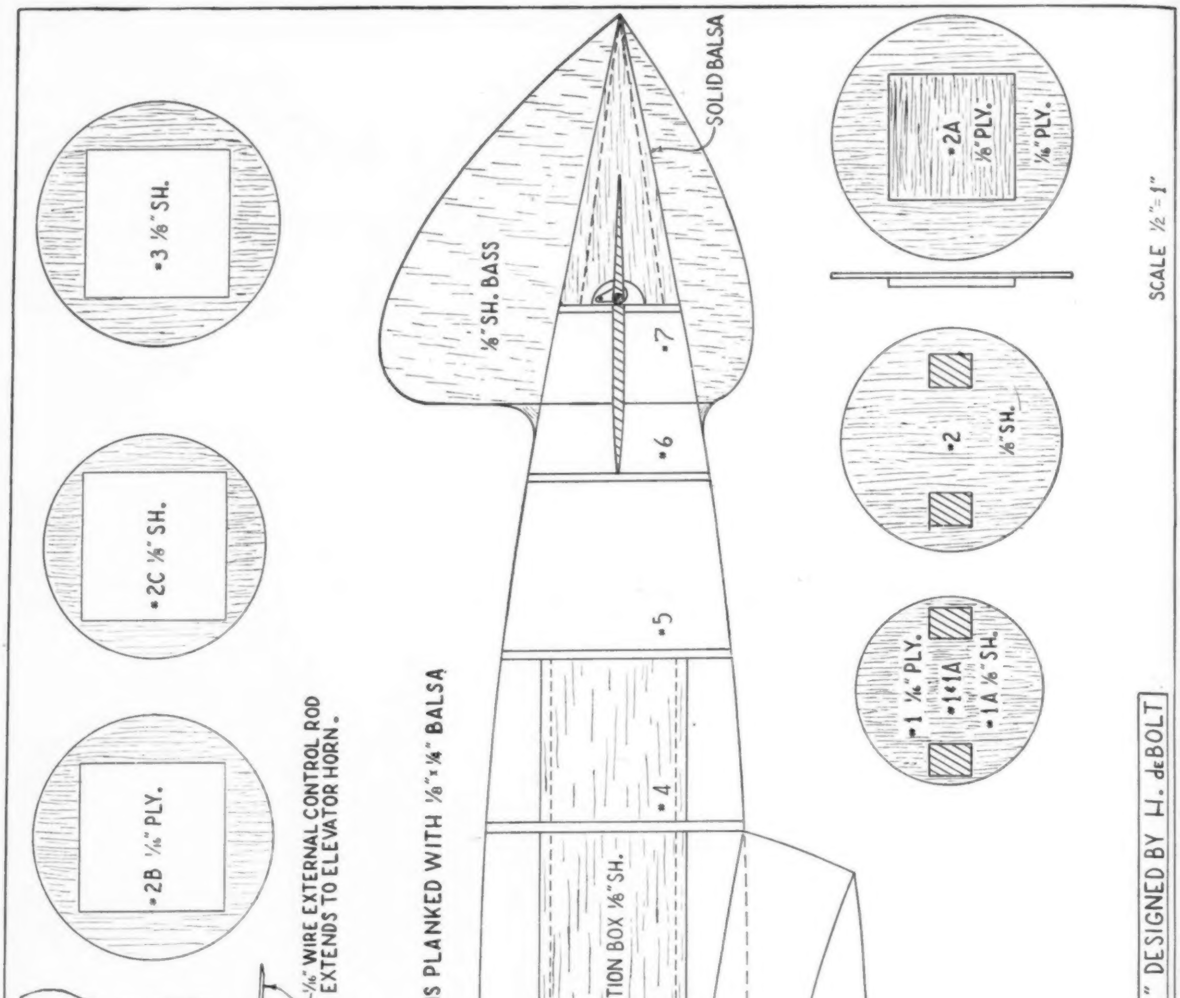
The P-38 has always possessed the versatility that is coming increasingly to characterize all combat aircraft. It has excelled at low-altitude strafing, high-altitude fighting, and as a particularly long-range bomber escort. Its distinctive silhouette, with its twin tail booms, has been seen over four major fighting fronts—The Aleutians, New Guinea, North Africa and Europe. All escorts on the second raid on Rome on August 13 were P-38's. In the daring surprise raid on Foggia on August 25, P-38's flew at only 75 to 100 feet above the ground. Its especially long range permits it to be ferried directly from bases in the United States to certain combat areas. The Lockheed P-38 *Lightning* has met and defeated the latest versions of Germany's two best fighters, the Focke-Wulf 190 and the Me-109, as well as the Jap Zero (Mitsubishi 00) and the so-called "super Zeros," the Mitsubishi types OOMK2, type O1, and the very latest type O3.

The two engines of the P-38 provide double security; many a pilot has come home on one engine, the other destroyed by enemy fire. Actually, the construction of the plane forces the enemy to consider three targets: the two engines, and the pilot. This is in contrast to other fighters where the pilot and engine together form but one target.

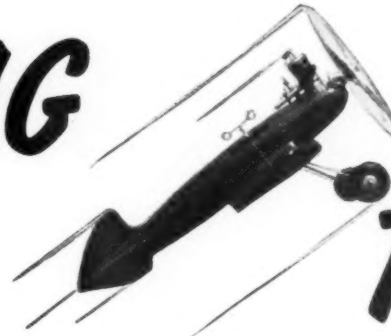
North American P-51 *Mustang*

Although superior to the P-40 and P-39, the original P-51 is also only a low- and medium-altitude fighter. Now in production is a new P-51 with a highly super-charged, Packard-built, Rolls-Royce *Merlin* engine, similar to the *Merlin* 61 engine in the newest *Spitfires*. Its performance is reported as even better than that famous ship's. The new engine gives

(Continued on page 34)


SOLID BALSA
1/8" SH. BASS
#7
#6
#5
#4
#3
#2,A,B,C
#1&1A
SOLID BALSA
IGNITION BOX 1/8" SH.
FUSELAGE IS PLANKED WITH 1/8" x 1/4" BALSA
1/16" WIRE EXTERNAL CONTROL ROD EXTENDS TO ELEVATOR HORN.
.040 WIRE
1/8" PLY.
BELLCRANK .025 DURAL
1/8" DOWEL
BUNCH
MOTOR BEARERS 3/8" x 1/2" BASS
2 1/4" WHEELS
#3 1/8" SH.
#2C 1/8" SH.
#2B 1/16" PLY.
#2A 1/8" PLY.
1/16" PLY.
#2
1/8" SH.
#1 1/16" PLY.
#1&1A
#1A 1/8" SH.
SCALE 1/2" = 1"
"THE FLYING TIGER" DESIGNED BY H. deBOLT

FLYING TIGER



by **H. deBOLT**

Here's a racy control-line gas model good for 75 mph

AFTER building and flying several control line models of conventional design we became interested in Vought's new Corsair design and decided to see what could be done with it. This is the result. The inverted wing has numerous advantages, well adapted to this type. With the short landing gear and clean lines afforded this model performs wonderfully despite its small size. The drawings call for a Bunch motor, although other motors can be used with corresponding performance. With a Bunch motor you can attain 75 mph. and still have a model that is not "too hot to handle."

CONSTRUCTION: You will find this type of wing builds up to a very strong and light unit; it will take all the punishment you can give it and at the same time affords pleasing lines. Start by cutting the ribs from stock indicated on the drawings; be sure to notch them properly so the landing gear fits flush with the surface. Next cut the leading and trailing edges from ½" and ¼" stock respectively. Pin them to your drawings and cement the ribs in place; working each half separately. Add the tips of solid stock and when dry cut the edges at the gull break and block up for required dihedral. Cement well.

When dry remove from the drawings and repeat for the other half. While this is drying insert the bass spars into the first half and cement; be sure overlapping joints get plenty. Complete the second half and join the two at the center-line, using 3/16" plywood plates.

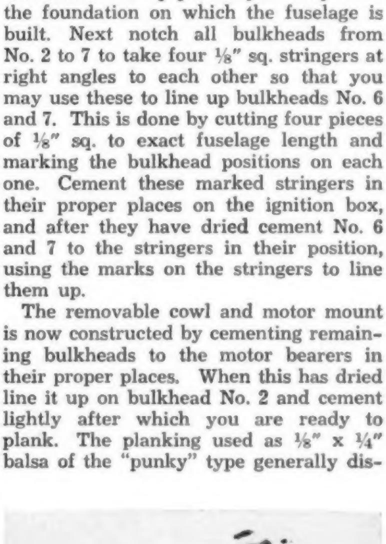
The landing gear is now bent from ⅛" wire to shape and size shown on the drawings. Bind it with heavy thread to the wing spars and the one plywood rib. Give it several coats of cement. ⅛" holes may be drilled in the plywood rib to facilitate binding, if desired. Add the small balsa fairing blocks to the leading edge at rib No. 1 and proceed to cover the leading edge with 1/32" sheet. Next install the cap strips and when dry shape leading and trailing edges with a sharp knife. Using fine sandpaper, go over the entire structure and remove all high spots until a perfectly smooth surface is attained.

FUSELAGE: The fuselage is of the good old planked monocoque type; its only disadvantage is the time required to build. However in a fuselage as small as this it actually takes less time than the conventional type, besides giving perfect streamlining and strength.

The first step is to build up a perfectly square ignition box from ⅛" sheet to dimensions shown. Next make the bellcrank from dural or most any metal and bolt to a piece of ½" x 1¾" plywood in the indicated position. Cut a slot in the top of the ignition box and cement the plywood in place as shown. Bend the .040 wire leaders and fasten to the bellcrank by soldering a washer to the projecting ends. After the fuselage is planked slots for the bellcrank and leaders are cut.

Bulkheads are now cut from the stock indicated, after which fuselage assembly is started. First cement bulkheads No. 2 through 5 on the ignition box in their proper places. It is necessary that these bulkheads line up perfectly as they form the foundation on which the fuselage is built. Next notch all bulkheads from No. 2 to 7 to take four ⅛" sq. stringers at right angles to each other so that you may use these to line up bulkheads No. 6 and 7. This is done by cutting four pieces of ⅛" sq. to exact fuselage length and marking the bulkhead positions on each one. Cement these marked stringers in their proper places on the ignition box, and after they have dried cement No. 6 and 7 to the stringers in their position, using the marks on the stringers to line them up.

The removable cowl and motor mount is now constructed by cementing remaining bulkheads to the motor bearers in their proper places. When this has dried line it up on bulkhead No. 2 and cement lightly after which you are ready to plank. The planking used as ⅛" x ¼" balsa of the "punky" type generally discarded as useless; however when used as planking this wood develops amazing strength due to the thin layer of cement between each strip. The technic is to cement one strip on and then one on the opposite side and in this way work around the fuselage. When you have about half the planks on it is a good idea to lay one down the middle of the remaining spaces and start over again so that they will not require so much of a bend to fit the fuselage contour.



When the planking has completely dried take a sanding block and proceed to knock down all high spots until you have a perfectly smooth surface; in doing this you should remove about 1/16" of the material.

At this time the stabilizer is cut from ⅛" bass and shaped to the airfoil shown. When completed notch the planking between bulkheads No. 6 and 7 on the centerline to take the stabilizer at zero incidence. Cement the stabilizer in this slot and while drying cut the two elevators from ⅛" bass and carve to a streamline shape.

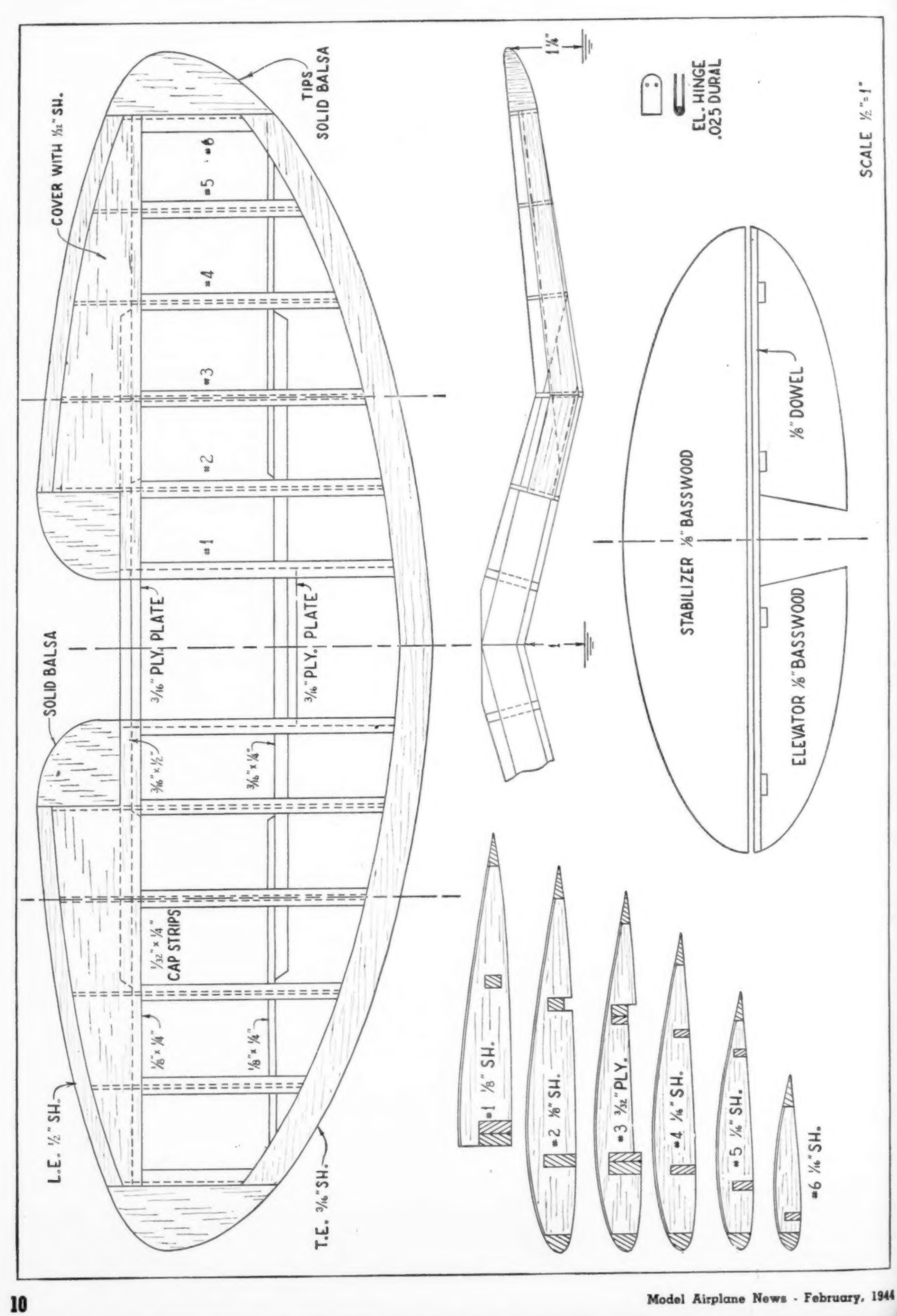
Next take a piece of ⅛" dowel and cement the elevators to it spacing them according to the drawings. While drying form the four elevator hinges and the elevator horn from .025 metal. Cement the horn in place and install the hinges by sliding them over the dowel and onto the stabilizer where they are bound with thread and cemented well.

The solid balsa tail cone is next roughed out and cemented in place. When dry sand to the final shape and proceed to cut the rudders from ⅛" bass which are given a streamline airfoil section. They are then slid into slots cut in the fuselage planking to offset them ¼" to the left. Cement well and allow to dry.

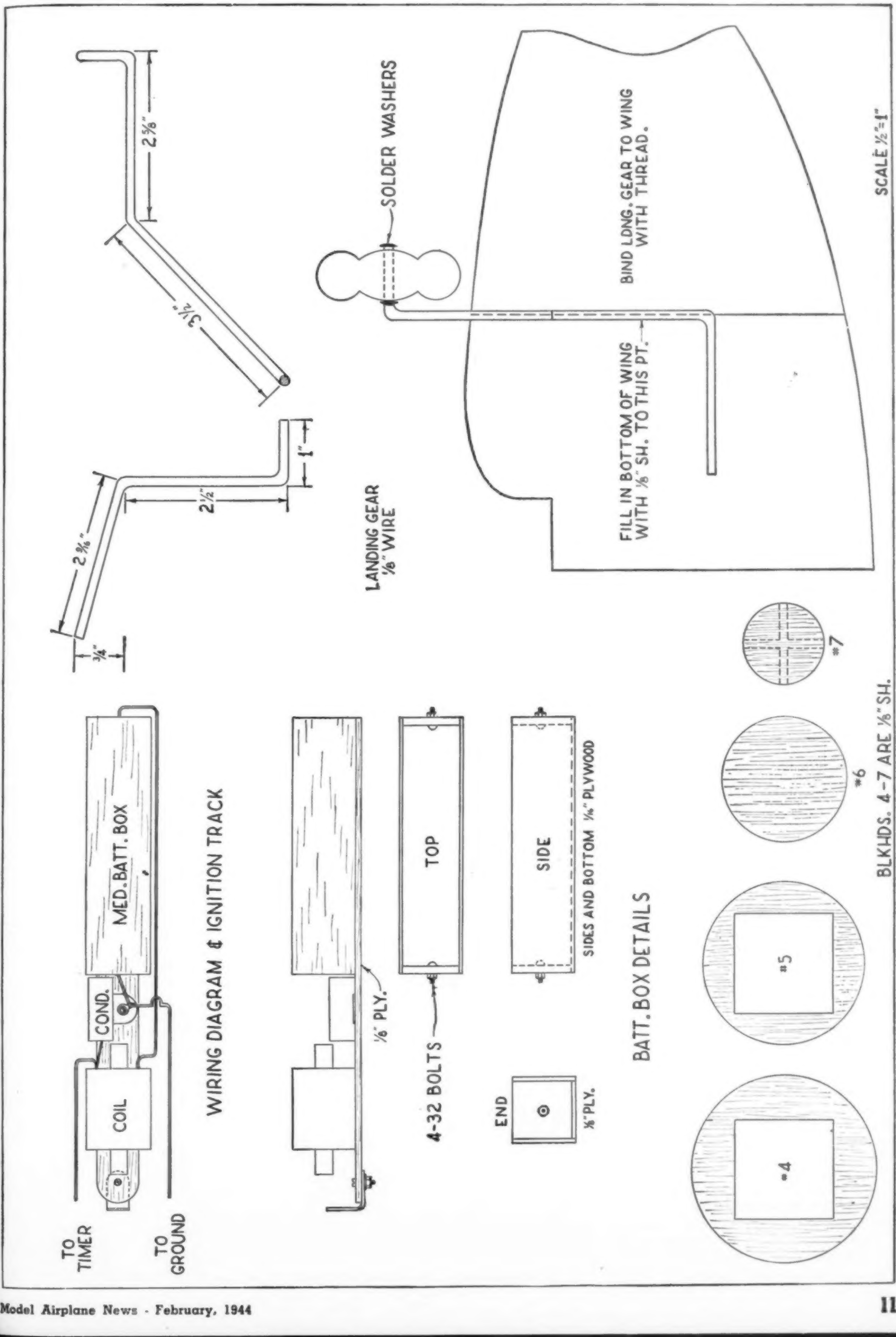
WING ASSEMBLY: The wing is installed on the fuselage by cutting slots in the planking to take wing spars. You will find these slots fall alongside the fuselage bulkheads to give a good strong joint. Block the rear spar down ⅛" to attain the proper incidence before cementing in place. The final step is to fill in the bottom of the wing as far as the gull break with ⅛" sheet and sand to contour.

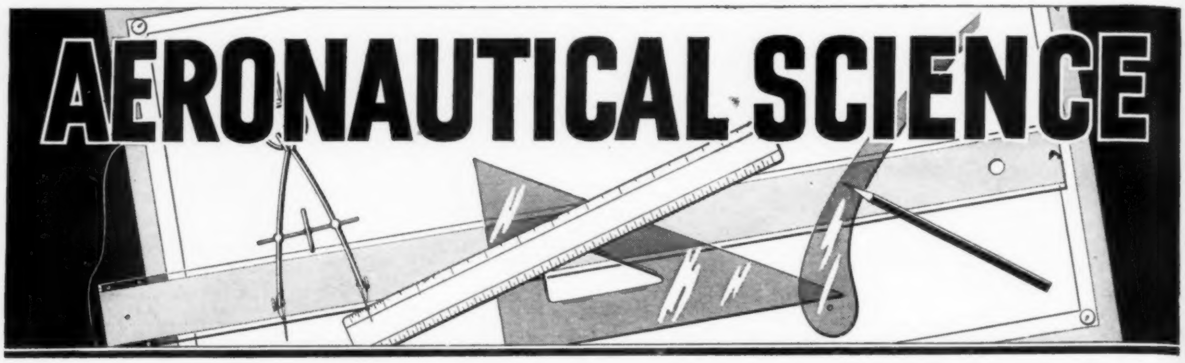
MOTOR UNIT: Cut the motor cowl from the fuselage between bulkheads No. 2A and 2B; a thin razor will do this job very nicely. Next drill the four motor

(Continued on page 56)



COVER WITH 1/32" SH.
TIPS SOLID BALSA
SOLID BALSA
3/16" PLY. PLATE
3/16" PLY. PLATE
3/16" x 1/2"
3/16" x 1/4"
1/32" x 1/4" CAP STRIPS
1/8" x 1/4"
1/8" x 1/4"
L.E. 1/2" SH.
T.E. 3/16" SH.
#1
#2
#3
#4
#5
#6
1 1/4"
EL. HINGE .025 DURAL
SCALE 1/2"=1"
1/8" DOWEL
STABILIZER 1/8" BASSWOOD
ELEVATOR 1/8" BASSWOOD
#1 1/8" SH.
#2 1/8" SH.
#3 3/32" PLY.
#4 1/16" SH.
#5 1/16" SH.
#6 1/16" SH.


SOLDER WASHERS
2⅝"
3½"
1"
2½"
2 3/16"
¾"
LANDING GEAR
⅛" WIRE
BIND LDNG. GEAR TO WING
WITH THREAD.
FILL IN BOTTOM OF WING
WITH ⅛" SH. TO THIS PT.
SCALE ½"=1"
TO TIMER
TO GROUND
COIL
COND.
MED. BATT. BOX
WIRING DIAGRAM & IGNITION TRACK
⅛" PLY.
4-32 BOLTS
TOP
SIDE
END
⅛" PLY.
SIDES AND BOTTOM 1/16" PLYWOOD
BATT. BOX DETAILS
#4
#5
#6
#7
BLKHDS. 4-7 ARE ⅛" SH.



THE supercharging of aircraft engines cannot always be advanced as the criteria for performance improvement in combat airplanes. The question frequently arises: "Why not put superchargers in those 'low and medium altitude' planes of ours so they can get into the stratosphere like the others?" or, more frequently: "Why not put a really *big* supercharger on our high altitude fighters so they can go right on up to 60 or 70,000 feet or even higher?"

To a certain extent these measures are possible but, unfortunately, there are definite limitations to supercharger-engine combinations making it impractical to advocate this form of power increase in all cases and to the degree desired in most cases.

During three of the four strokes of operation of the modern aircraft engine, it is simply an air pump doing the work of drawing in a weight of air, compressing it and pushing it out. And insofar as the fourth (power) stroke is used for the operation of the other three, the entire engine may be considered an air pump.

Pumping results in pressures and these require serious consideration in the design and operation of aircraft engines used alone and, particularly, when used in combination with a supercharging device.

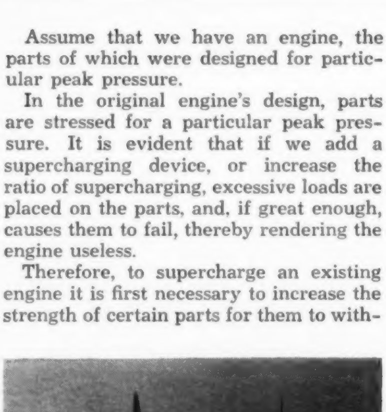
At the start of the intake stroke there is no pressure in the engine cylinder but when the piston starts up on the compression stroke a pressure is built up which reaches its maximum on the power stroke. At the end of the exhaust stroke pressure again drops to zero. Pressures in the large-size engines used today run as high at 1400 psi. The most important pressure, however, is the *average* pressure found throughout the operation cycle; this is known as the *mean effective pressure*. The *mep* multiplied by number of power strokes per minute, piston area and length of stroke gives power developed by the cylinder.

Function of the supercharger is merely to pump more air into the engine. This results in a pressure between the supercharger and engine within the intake manifold known as *manifold pressure*. This pressure is desirable as it forces an increased weight of air into the cylinders on the intake stroke. However, it is detrimental for it increases the *mep*, thereby increasing maximum or peak pressure within the cylinder. This results in increased loads on the cylinder walls, piston rods and crankshaft bearings.

Assume that we have an engine, the parts of which were designed for particular peak pressure.

In the original engine's design, parts are stressed for a particular peak pressure. It is evident that if we add a supercharging device, or increase the ratio of supercharging, excessive loads are placed on the parts, and, if great enough, causes them to fail, thereby rendering the engine useless.

Therefore, to supercharge an existing engine it is first necessary to increase the strength of certain parts for them to withstand increased loads. Such "beefing up" results in increased engine weight, a serious factor in aircraft installation. It also requires considerable time, money and research. For these reasons, then, we cannot simply "add a supercharger" to low and medium altitude planes for increased performance at altitude.



Lockheed P-38 *Lightning* fighter showing twin turbosupercharger installations

There is an optimum degree of supercharging which limits the power of aircraft engines above certain altitudes. The ability of an engine to produce power varies indirectly with what is termed the *altitude-density ratio*: air density at sea level divided by air density at altitude desired. In engines equipped with gear-driven superchargers, when this *ratio* falls to about 0.117 (found at approx. 55,400 ft.) all the engine power is consumed in overcoming the friction of moving parts, leaving zero power available for driving the propeller. This altitude, then, (or somewhat below it) is as high as an engine of this type can pull a plane, regardless of cylinder arrangement, compression ratio, cylinder chamber form or supercharger gear ratios.

To a lesser extent this also applies to turbo superchargers although experiments have not yet revealed the exact altitude at which zero power results and the altitude is somewhat higher.

Limitations are imposed upon turbo supercharger ratios by centrifugal stresses in the impeller blades, blade tip speeds, duct losses, low pressure and air density at high altitudes and back pressure in the engine exhaust.

In supercharging, it is not the *quantity* of air pumped to the engine that is important, it is the *weight* of air. As air density decreases (only ¼ sea level at 40,000 feet) the supercharger pumps a greater quantity to deliver the required weight. Thus, the supercharger must work harder the higher it goes. Since it has more work to do, it is evident the engine must deliver more power to it. This power takes the form of *exhaust back pressure*. When this *ebp* reaches 32-35 in. Hg. severe loads are imposed on the exhaust valves which quickly become critical. From ½ to 1% of full throttle power is lost per each in. Hg. increase in *ebp*.

When the speed of the impeller blade tips reach the speed of sound (1150 fps varying with temperature) compressibility and turbulance effects seriously lower the efficiency of the flow. These high tip speeds also impose severe centrifugal stresses.

Losses due to friction in the ducts and manifolds vary inversely as the square of the *altitude-density ratio*. It is evident, then, that all these factors augment into a complete lack of turbo output at some altitude, depending upon its size and speed. For turbos in use today, this altitude is approximately 52,000 feet.

Various other types of power producers have been advanced (such as the steam engine, gas turbine, etc.) and some are now under development for aircraft. However, oxygen is necessary to support combustion, irrespective of the engine type and it is highly doubtful if these other forms of engines will combat the problem of high altitude flight any more successfully than has the turbosupercharger.

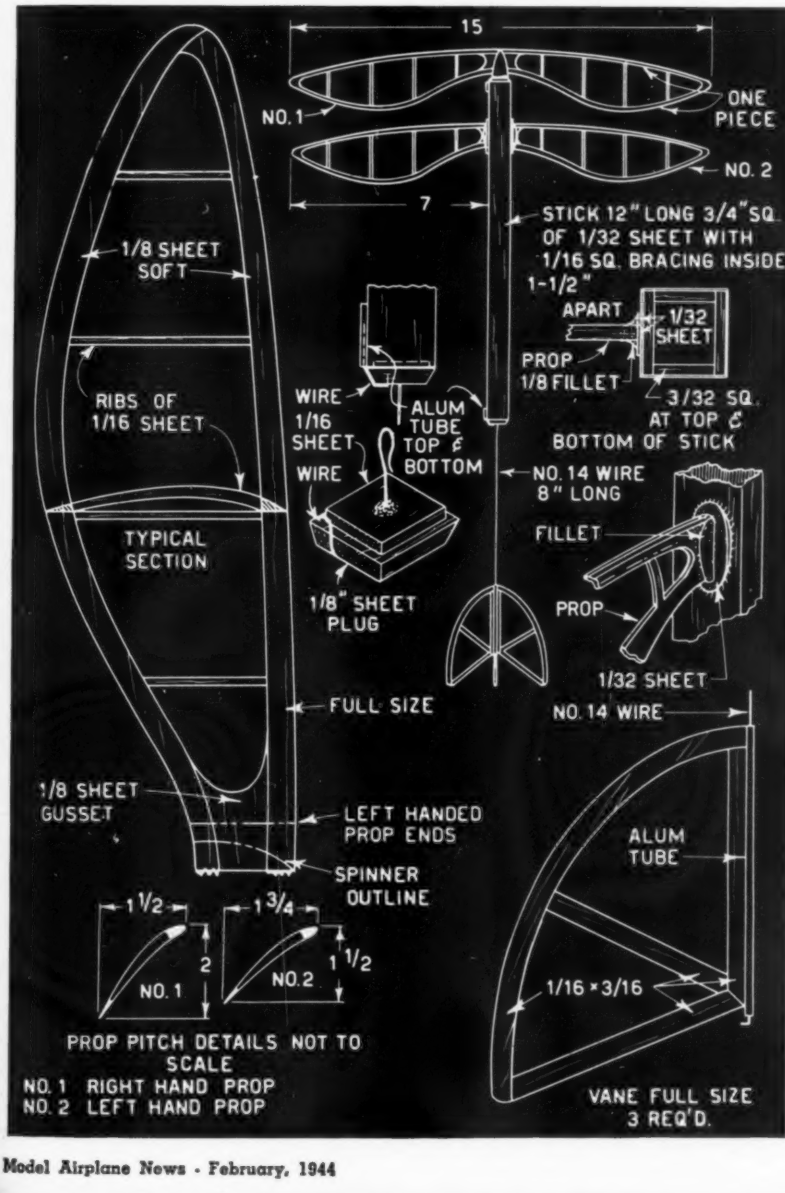
The possibility of carrying a supply of oxygen within the airplane for engine use has been suggested but the quantity necessary renders this idea impractical.

(Editor's Note: We invite inquiries to this department concerning aeronautical science problems.)

VICTORY

The UPSTART

BY TONY SHOTT



NO MODEL building career can be called complete without a venture into the "freak" or "experimental" side of modeling. With this in mind we present the Upstart—outdoor record holder heliocopter.

Pleasing lines, flying ability and ease of construction work hand in hand, making this model a pleasant experience to both expert and novice.

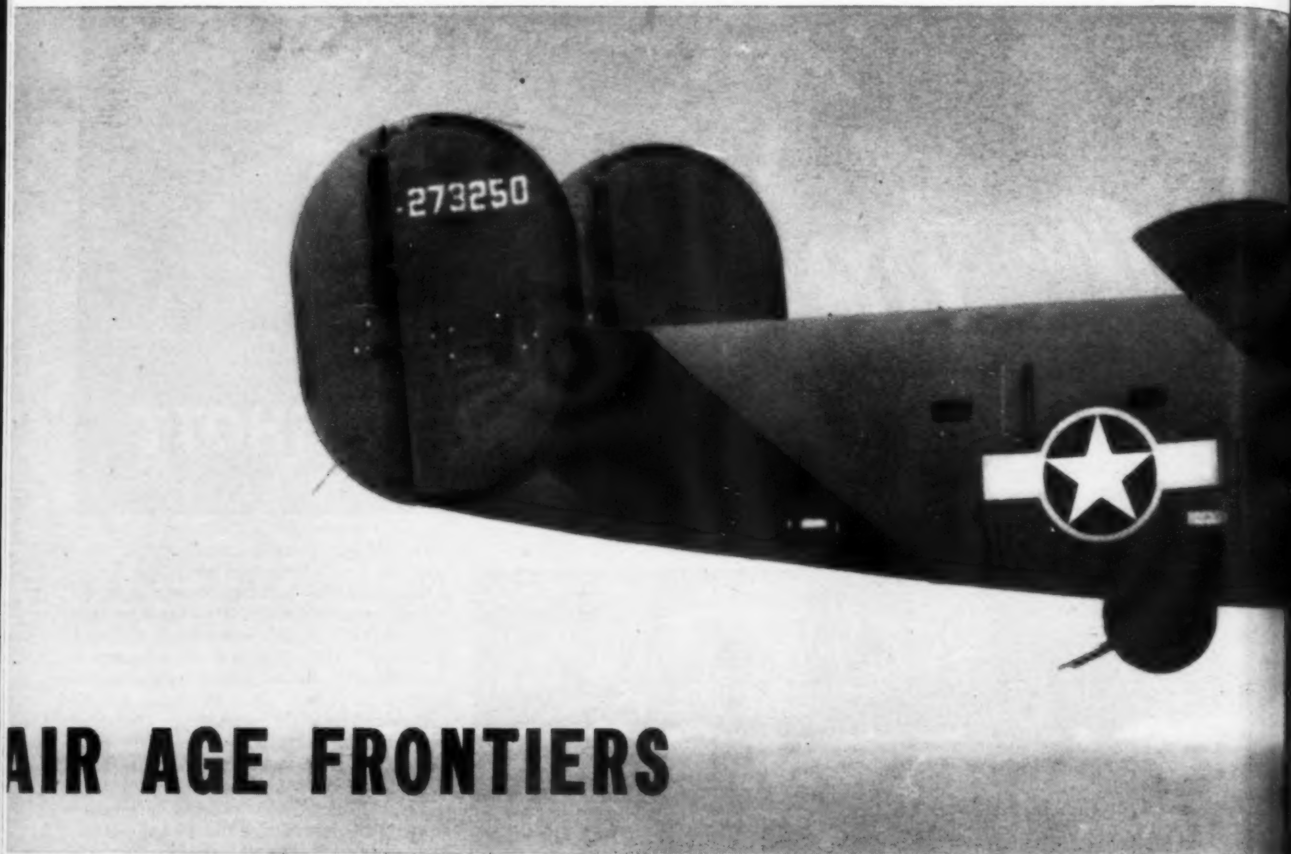
The Upstart was created primarily from the knowledge and experience gained through several indoor heliocopter attempts, and through a study of previous designs by other modelers. As to the constructional design, you will find it rugged yet not heavy, as you know that weight is an ever important factor in models of this type.

CONSTRUCTION: Start with the stick or tube as you may call it. Cut four side blanks out of 1/32" stiff quarter-grain sheet, reinforce with 1/16" square at 1-1/2" intervals when sides have been cut. When dry assemble sides. Reinforce both ends of stick with 3/32" square, glued inside the stick ends. Then make plugs of 1/8" sheet. Glue facing on to make snug fit in stick ends. Glue wire on for plug clips. Kink wire slightly to fit snugly in aluminum tubing, then glue on tubing and clips.

PROPS: First cut leading and trailing edges from soft 1/8" sheet (quarter-grained). Make template for airfoil of props. Cut ribs from stiff 1/16" sheet; then build props in two halves flat on work board. When dry affix hub gusset also of 1/8" sheet. Be doubly sure to make a right-hand prop and a left-hand one. The left-handed prop of course will be kept in separate sections—halves, as the tube acts as its hub. When props have dried and are still uncovered heat water and steam the pitch in them. While this may strike you as being hard to do, it is, in reality, a very simple and efficient process. Just take your time and steam the pitch in slowly. When this has been done cover both sides of the props with wet tissue to guard against wrinkles. Fix

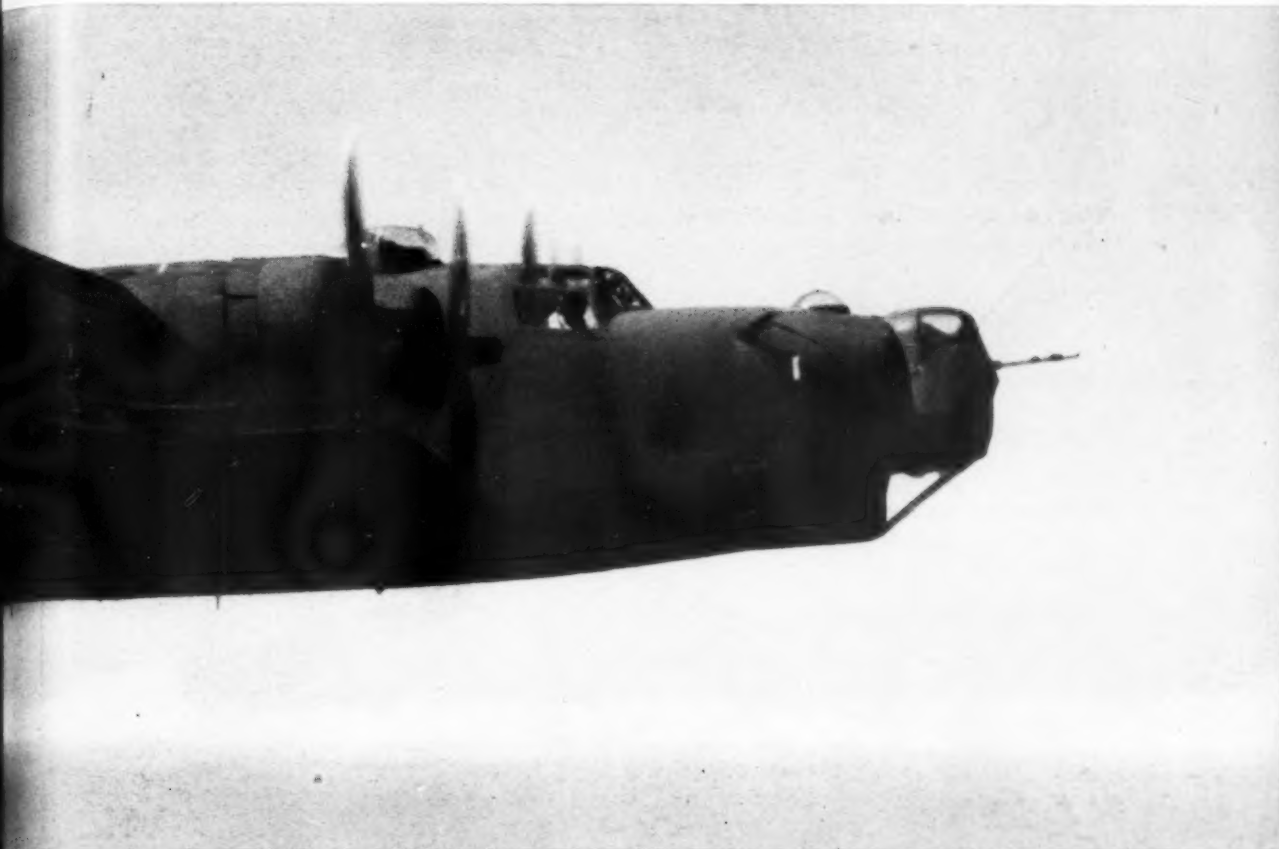
(Continued on page 48)

AIR AGE FRONTIERS



Latest version of the Consolidated *Liberator* long range bombe mplete d

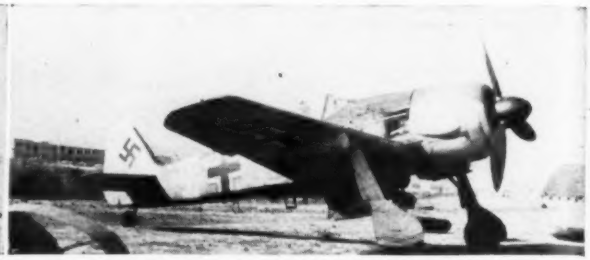
Coast Guard's Grumman J4F-1 *Widgeon* does anti-submarine patrol work with two 250 lb. depth charges under wings.



mbe plete description of the *Liberator* will be found on page 19

Venerable Hall Aluminum PH-3 flying boat now used by the Coast Guard for anti-submarine patrol carrying depth charges.

Here's the difference between the Kellett YG-1A *autogiro* on left and Sikorsky YR-4B *helicopter* on right.



Spoils of war! Captured on Italian airfields by advancing Allied forces was a Gotha Go 242 glider and a Focke-Wulf Fw 190A4

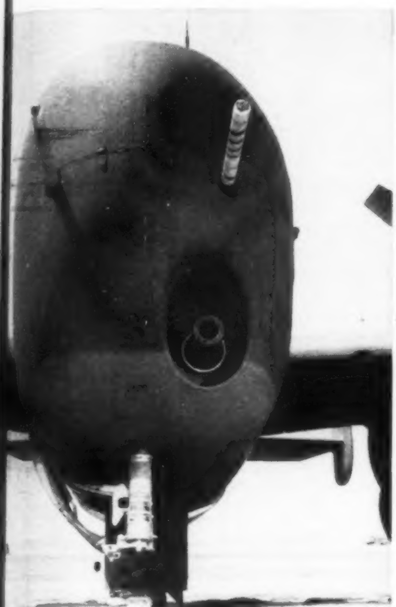
R.A.F.'s *Spitfire* IX A2 is unarmed photographic version

Bell *Airacobra* TP-39 two-seat trainer has single-seat performance

Hawker *Hurricane IID* mounts two Vickers 40 mm cannon

Lockheed C-69 *Constellation* is world's fastest transport carrying 55 passengers and crew of 9. Four Wright R-3350 engines employed

MITCHELL CANNON FIGHTER



Closeup of nose showing cannon and .50's

THE largest weapons ever mounted in an airplane, 75 millimeter cannon, have been installed in North American B-25 Mitchell bombers, and have been used in action against the enemy for the past several months.

Details of the new armament development, which was worked out by the company's armament engineers in cooperation with United States Ordnance Department officers, were made public by North American with the permission of the War Department.

Principal use of the cannon-carrying bombers will be against shipping, gun emplacements, landing barges, tanks, and enemy planes, it was revealed.

Already used in the South Pacific and probably other war zones, the B-25s' 75 millimeter cannons have been credited with aiding in sinking a Japanese destroyer, pulverizing Nazi vessels, and destroying important military targets.

In installing the cannon in the B-25 the United States Army Air Forces has virtually lifted the artillery into the air.

The 75 millimeter cannon can best be compared with the famous French '75', the field gun used with such devastating effect by the Allied artillery in World War I.

While it might seem that a B-25 would literally "hang" in midair from the effect of the shell being fired from its nose, actually the recoil felt in the airplane is almost negligible. The recoil for the discharge is taken up by a secret-type (hydro-spring) recoil device. In fact, pilots who have flown this particular type B-25 describe the sensation of the 75 millimeter gun firing as similar to the vibration of an automobile "coughing" on a cold morning.

The shells fired from the cannon are 26 inches in length and weigh 20 pounds each. The projectile proper weighs 15 pounds.

North American armament engineers said that one of the projectiles will penetrate both sides of a medium tank. One high explosive HE shell—shrapnel is not used—is capable of putting an AA battery out of action, they said.

Giant missile weighs 20 lbs. and is 3 in. dia.

In tests, three shells were fired in ten seconds.

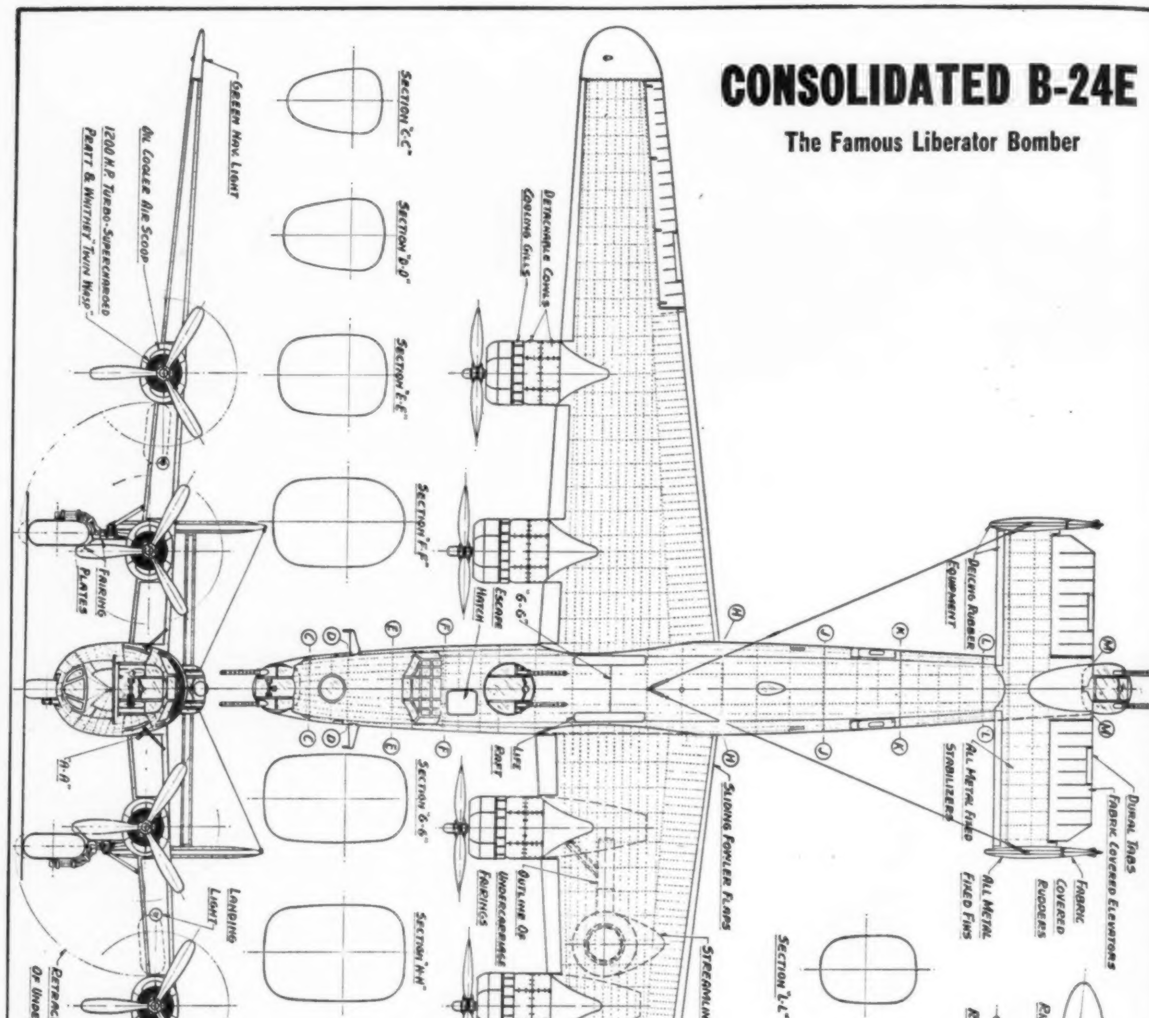
In making changes in the bomber to ac-

(Continued on page 40)

One! Jap destroyer falls in cannon sights. Two! Mitchell cannon lets go with 75 mm shell. Three! Damaged destroyer wallows helplessly

CONSOLIDATED B-24E

The Famous Liberator Bomber



CONSOLIDATED LIBERATOR

Plane on the cover

FREQUENTLY amusing is reference to the "mushroom growth" of the aviation industry and how "overnight" a certain firm has blossomed into a giant, sprawling enterprise with dozens of plants throughout not only the United States but the entire world. There is an element of truth in such statements when the reference is pointedly made to actual manufacturing facilities and employed personnel. But there has been no such transfiguration in the reputation, organization or engineering and production skill of any of the established names in aviation.

Typical is gargantuan Consolidated-Vultee Aircraft Corporation whose fabulous capital structure is intertwined with Republic Steel, Aviation Corporation and the Chase National Bank. But when Consolidated was organized in 1923 at Greenwich, Rhode Island it occupied a small portion of a small building which was shared by Gallaudet Aircraft Corporation. In its infancy, Colsolidated was the work of one man, Major Ruben Fleet, who designed the two-seat biplane trainer bearing his name with which every flying man has had at least one personal experience. The light, stable instruction machine was an immediate success and Fleet moved his small facilities to a newer and larger plant in Buffalo, New York in 1924. From 1924 to 1929 Consolidated built hundreds of these trainers for the Army, Navy, Coast Guard, private buyers and foreign governments.

In 1927 Mr. Isaac McLaddon resigned from the Engineering Division of the U. S. Army Air Service at McCook Field, Dayton, Ohio (where he designed the first American all-metal airplane in 1922) and joined Consolidated to design flyingboats, bombers and other heavy flying equipment. This first job was the Consolidated *Admiral*, a 100-ft. span giant twin-engine flyingboat which was purchased by the U. S. Navy and designated the PY-1. After this initial success the huge boat was refitted for passengers and, as the *Commodore*, it went into service on the world's longest airline, running a distance of 9,000 miles through 15 countries of South America. This line later became known as Pan American Airways.

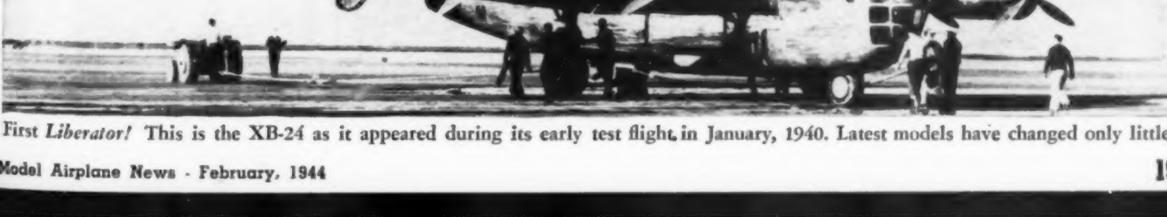
The Navy design was improved with the P2Y-1. On Sept. 7th and 8th, 1933, a formation of six of these craft attached to Patrol Squadron VP-5 flew non-stop from Norfolk, Va. to Coco Solo, Canal Zone, a distance of 2,059 miles, setting a record for distance formation flights. The following year this record was broken by the same six machines when, on January 10th and 11th, 1934 they flew non-stop from Oakland, California, to Honolulu, Hawaii, a distance of 2,414 miles in 24 hours 19 minutes. They were under the command of Lt. Comdr. Knefler McGinnis, U.S.N.

A revolution in flyingboat design came with the XP3Y-1, first flyingboat in the world to incorporate retractable floats, integral fuel tanks, stressed skin wing, double-row radial engines, constant speed propellers and full cantilever empennage. It made its debut in the Navy with an international record-smashing flight on October 14th and 15th, 1935, from Cristobal Harbor, Canal Zone to San Francisco Bay, California, a distance of 3,281 miles. Again Lt. Comdr. Knefler McGinnis commanded the flight.

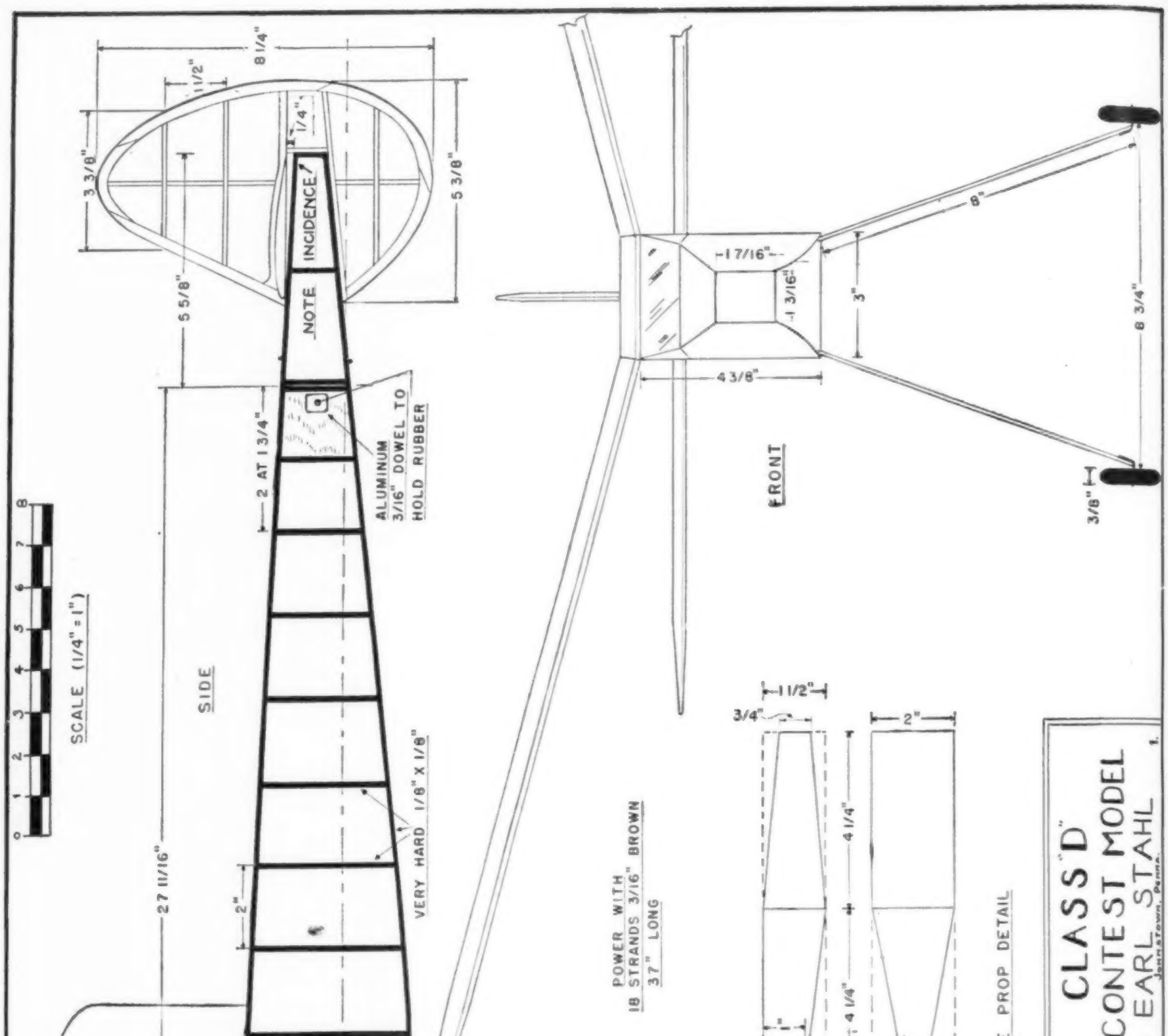
During 1935 Consolidated's facilities at Buffalo were proving inadequate, plus bad weather and poor harbor conditions. In view of the year-'round flying weather, the tremendous expanse of flyingboat facilities and adequate supply of labor and materials in Southern California, Consolidated moved its entire equipment to Lindbergh Field, San Diego, California directly across San Diego Bay from the Navy's North Island patrol boat base.

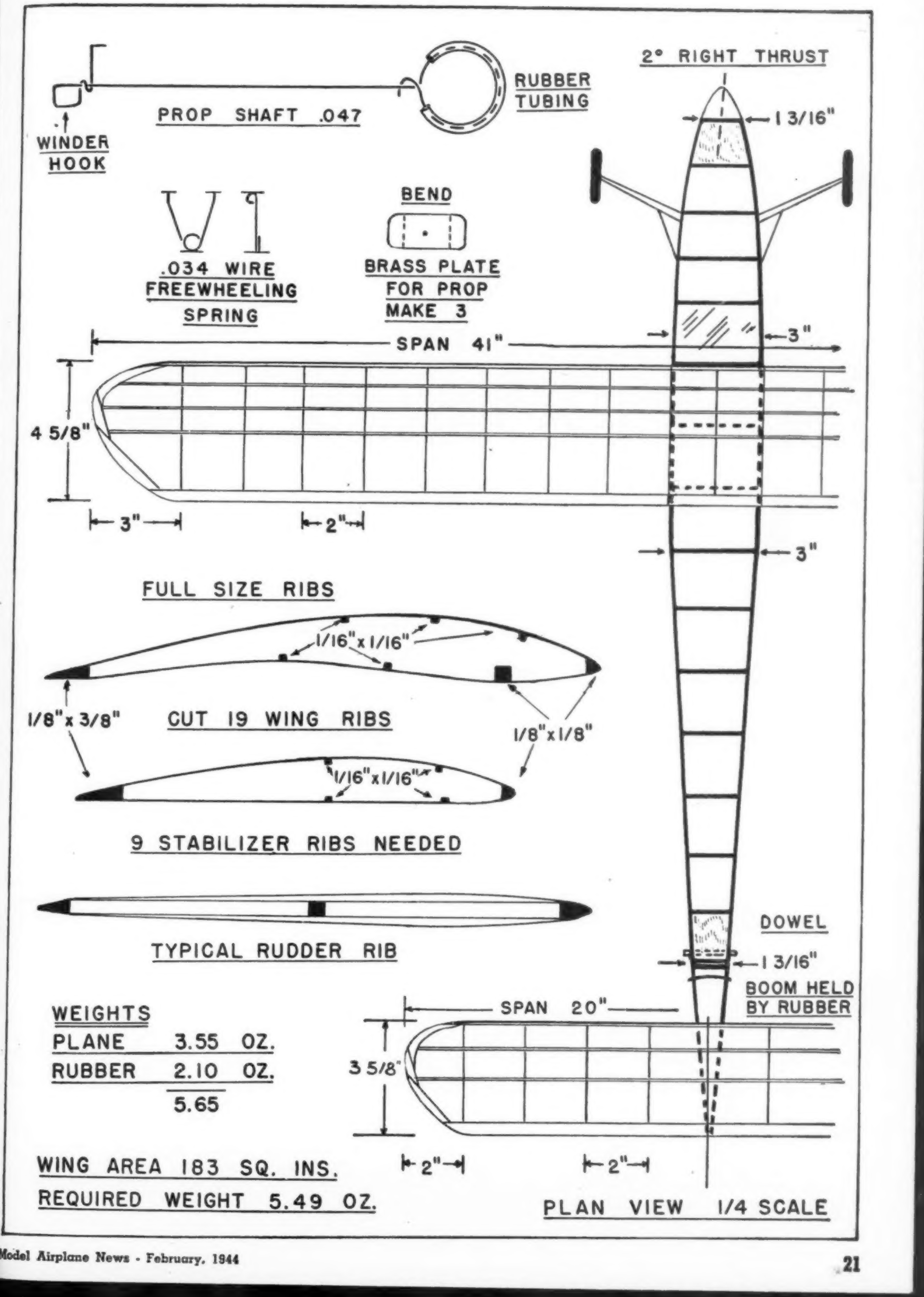
It is interesting to note that Consolidated's vice-president and general manager at Buffalo was a young man by the name of Lawrence D. Bell. When the firm decided to move to California Larry Bell, together with Consolidated employees Ray Whitman and Robert Wood, announced their intention to remain in Buffalo and start their own aircraft firm. In the plant vacated by Consolidated

(Continued on page 49)



First *Liberator!* This is the XB-24 as it appeared during its early test flight in January, 1940. Latest models have changed only little


CLASS "D"
CONTEST MODEL
by EARL STAHL
JOHNSTOWN, PENNA.
SIDE
FRONT
SCALE (1/4" = 1")
NOTE INCIDENCE
ALUMINUM 3/16" DOWEL TO HOLD RUBBER
2 AT 1 3/4"
VERY HARD 1/8" X 1/8"
27 11/16"
POWER WITH 18 STRANDS 3/16" BROWN 37" LONG
4 AT 1 1/2"
RUBBER BAND
2° DOWN THRUST
1/16" X 1/4" BAMBOO
ONE BLADE PROP DETAIL
SOLDER WEIGHT
LANDING GEAR WIRES .040
FRONT
REAR


PROP SHAFT .047
WINDER HOOK
RUBBER TUBING
.034 WIRE FREEWHEELING SPRING
BEND
BRASS PLATE FOR PROP MAKE 3
2° RIGHT THRUST
1 3/16"
3"
SPAN 41"
4 5/8"
3"
2"
3"
FULL SIZE RIBS
1/16"x1/16"
1/8"x3/8"
CUT 19 WING RIBS
1/8"x1/8"
1/16"x1/16"
9 STABILIZER RIBS NEEDED
TYPICAL RUDDER RIB
DOWEL
1 3/16"
BOOM HELD BY RUBBER
SPAN 20"
3 5/8"
2"
2"
WEIGHTS
PLANE 3.55 OZ.
RUBBER 2.10 OZ.
5.65
WING AREA 183 SQ. INS.
REQUIRED WEIGHT 5.49 OZ.
PLAN VIEW 1/4 SCALE

QUITE some time ago we discovered that by adding a suitable weight (such as the wound kite string) to the nose of a common dime-store, triangular kite, it could be made to glide very decently. So, when casting about for "something different" to build, we recalled this fact and became determined to see if a practical model of similar design could be constructed.

After several unsuccessful attempts the Power Kite was finally realized in its present form. You'll find her a snappy climber and quite reluctant to spiral in. This is also about the simplest and most quickly built ROG there is; and if you'll glance at the plans, you will see why.

WING AND TAIL: Both wing and tail units are constructed simultaneously. You can work directly on the plans, but it will be necessary to cut out the stabilizer apex and paste it in its proper place (line up A-A with A'-A') or else the apex may be drawn in by continuing the lines forming the outside edge of the stabilizer, until they meet. (This will make it necessary to paste a blank sheet of paper at A-A.)

Start construction by pinning down the wing leading edge (L.E.) which is a 3/32" sq. balsa strip. (Surely you can scrape up enough balsa fragments to fill the small needs of the Power Kite!) Nick the L.E. as shown, and bend it back to form the proper sweep-back angle.

Now take some 1/8" x 1/32" strips and lay down the wing tips and stabilizer side, simultaneously cementing them in place. (You will disconnect them later.) The wing trailing edge (T.E.) and stab. (L.E.) are of 1/16" sq. and are pinned down next, followed by stab. center piece and cross members.

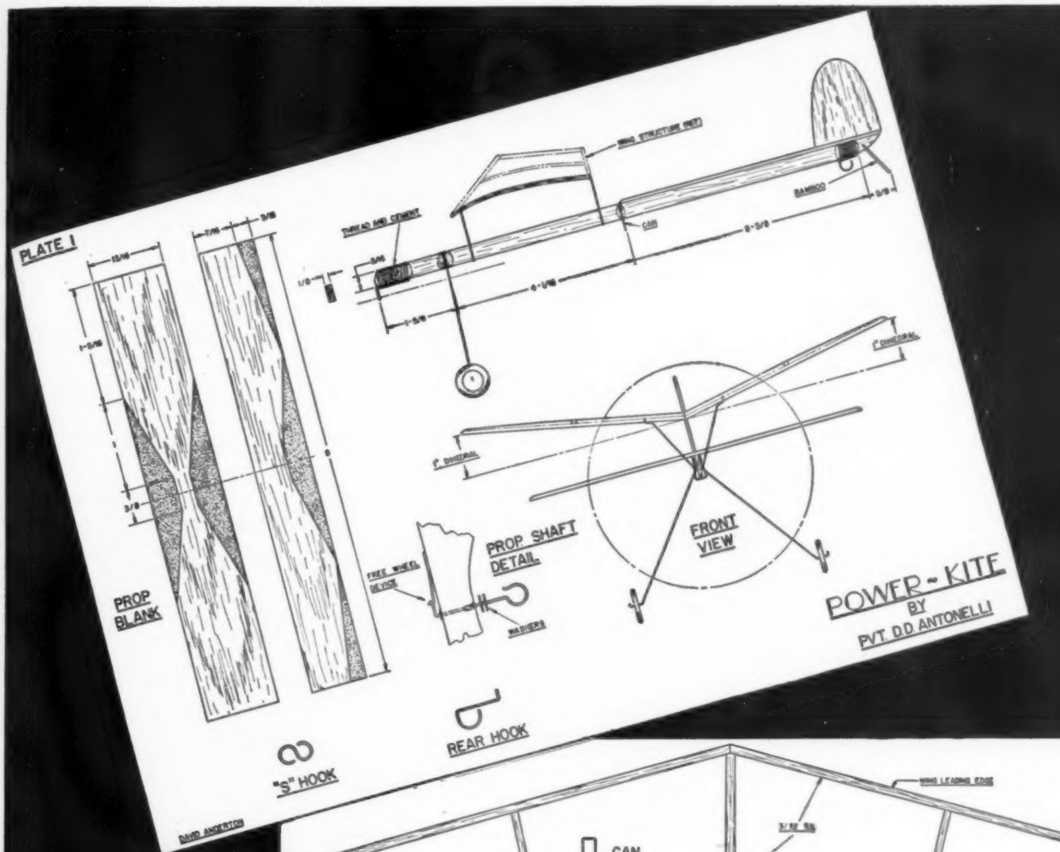
The number of wing ribs comes to a grand total of three; center rib, of 3/32" sq. and the others of 1/16" sq. The slight camber required is applied by rolling a pencil over the balsa strip from which the ribs are to be cut. It will be necessary to wet the 3/32" strip before it can be curved properly.

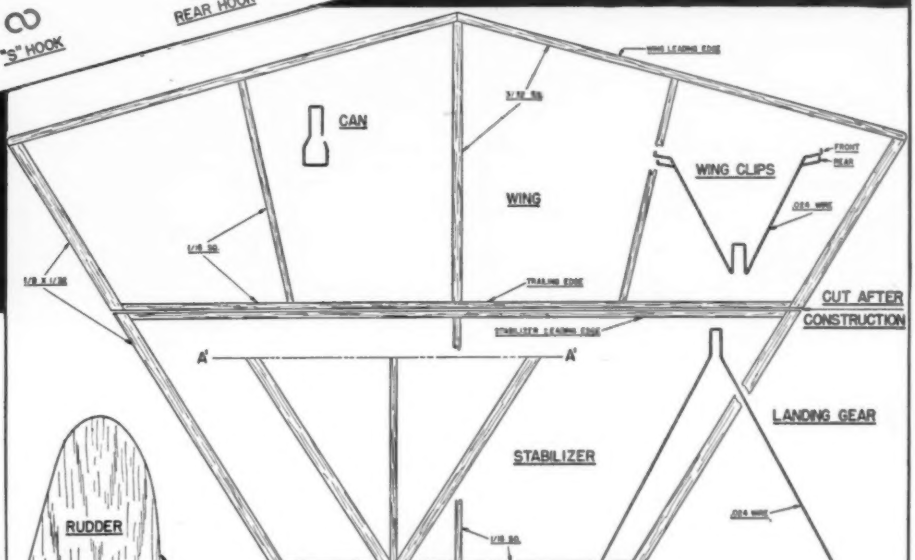
These sections are now left to dry. In the meantime trace the rudder outline on a piece of 1/32" sheet and cut it out, sanding it lightly to a smooth finish. Now form the wing clips from .012 wire. After the wing and tail sections are thoroughly dry detach them at the proper places and remove them from the plans. Bend the wings at the center till they acquire 1" dihedral at each tip. You'll have to delicately crack the center joints to do this. Apply a fresh coat of cement to all joints.

Attach the wing clips and make them secure with cement and a few turns of thread. Use Jap tissue for covering. Don't think this is being unpatriotic, because when we realize the value of model building, we see that it is actually an instance of fighting the enemy with their own materials. (To editor: Is the stuff really made in Japan?)

The sections are covered on the top side only. Use light bodied, clear dope as an adhesive, and attach the paper to all structure except the 1/16" sq. wing ribs and the stab centerpiece cross members. The wing is covered with two pieces of tissue. Do not shrink or dope covering. Try to avoid wrinkles or folds, but don't make the covering too tight; this may cause warping, and in any case is just extra bother with no reward in appearance or efficiency.

STICK AND PROP: The motor stick is shown half-size on plate 1; however, actual dimensions are given and it will not be necessary to do any scaling up.





Select a piece of hard balsa (1/8" x 5/16" x 11-3/4") for your stick. The simple thrust-bearing may be bought at your local model shop, but very likely, you have several lying around. Cement it in place and secure it with thread and cement. Fashion the rear hook and secure similarly. The landing gear is shown full size. Bend it to form from .012 wire, cement the L.C. as shown and add three or four turns of thread for a permanent job. The wheels are ¾" in diameter, either hardwood or balsa. A sliver of bamboo makes a good tail skid. The can and S hook are also formed at this time.

Now for the propeller. This is the only fastidious job to cope with, but if you work slowly and patiently you won't find it at all hard. Your propeller block should be of medium hard balsa, 5" x 13/16" x 5/8". Lay out the guide lines as shown. Carving is done with any tools you see fit to use. (The author usually finds he has resorted to a jack-knife, a fine-toothed jig saw and a variety of razor blade fragments before the propeller is ready for the final sanding operation.)

Pierce the hole for the propeller shaft (.012 wire to form shown) and balance prop on a piece of wire, smaller in diameter than the object used for piercing. See that the blades assume a horizontal position after being spun. The blade thickness should be about 3/16" near the hub, tapering to 1/32" at the tips. Blade thickness varies with hardness of the wood used; if the wood is soft, the blade should be thicker. A small eyelet is used as a rear-bearing and a washer is cemented to the front of the hub, to prevent wear. Notice the construction of the free-wheel device. See that the propeller rotates freely when the motor is unwound. Give the propeller one or two coats of dope, followed by sanding with a fine grade of sandpaper.

ASSEMBLY: The rudder is cemented in place onto the stabilizer. The stabilizer,

(Continued on page 48)

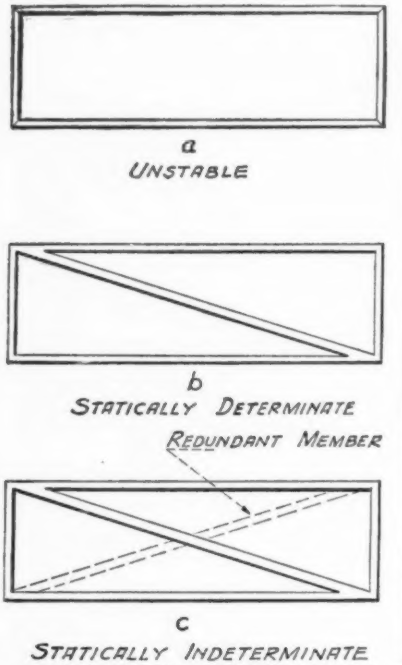


Fig. 1—Types of ideal truss structures

STRESS YOUR GAS JOB

by

J. P. EAMES *and* W. L. NYE

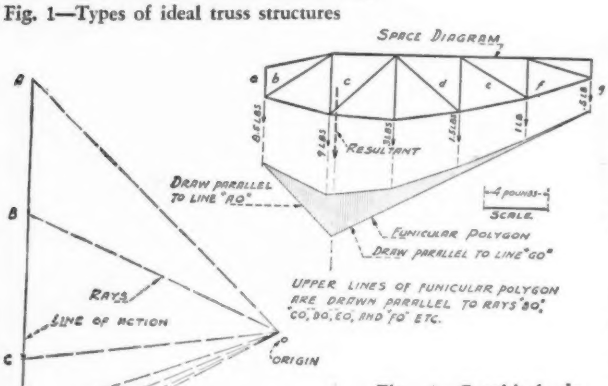


Fig. 2—Graphical determination of fuselage center of gravity

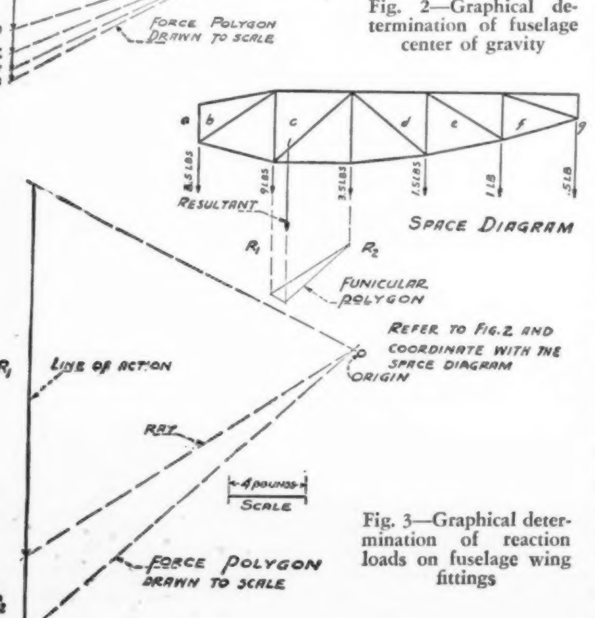


Fig. 3—Graphical determination of reaction loads on fuselage wing fittings

FUSELAGE ANALYSIS

BEFORE a detailed discussion is undertaken, it should be understood that the stress analysis of a model airplane is different than what would be made for a full scale airplane. In many instances on model aircraft, structural members are made oversize purposely to obtain rigidity and the necessary degree of stiffness. Proper consideration should be given to the design of members or attachments which will absorb the shock or dissipate the forces caused by hard landings or ground handling.

Model Stresses

A model airplane fuselage is stressed by the shock of hard landings, ground handling, and the engine torque load. These may be considered primary loads. The air loads developed by the stabilizer fin, rudder and the loads transmitted by the wing fittings during the various altitudes of flight may be considered secondary loads. It is assumed that in order to obtain lightness and a high strength to weight ratio, a model airplane fuselage is constructed as a space framework structure. Such a fuselage usually has two, three or four longerons. The longerons, frames and diagonal brace members are subjected to compression, tension and bending forces during flight and landing conditions.

All of the component structures comprising the model airplane under discussion are assumed to be statically determinate. This disposition of the structural members is necessary if it is intended to construct the fuselage accordng to the fundamental principles which will be described. Statically determinate structures, as the name implies, are structures in which all of the loads to which they are subjected are capable of being determined by the ordinary methods of graphic statics, or by the conventional equations of statics. The loads are external and internal. The foremer are called "reactions" and the latter are called "stresses." If the forces imposed on a structure cannot be determined by the ordinary methods of graphic statics, that structure is statically indeterminate. A simple analysis will enable the layman to classify any structure into either of these categories. This test consists of an investigation of the number of unknown force elements in the structure. If the number of unknown force elements is not greater than three, the structure is statically determinate. Conversely, if the number of force elements is greater than three, the structure is statically indeterminate.

Reference to Fig. 1 will provide a practical problem. The structure shown in "a" is unstable. It is obvious that this structure will tend to collapse under any system of imposition

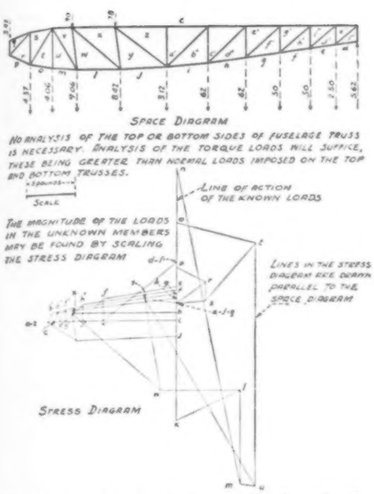


Fig. 4—Graphical solution to fuselage loads

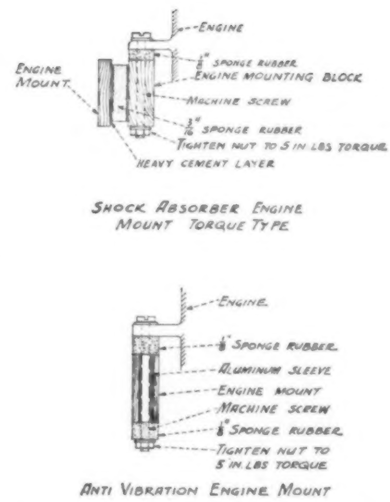


Fig. 5—Suggested shock-mounting of engine

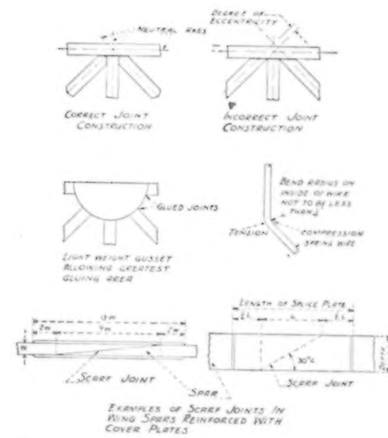


Fig. 6—Structural details of fuselage joints

of loads sufficient to overcome the local resistance of the joints. If the structure contains a diagonal brace, it will be rigid and will not collapse under any load within the allowable strength of the material. This is shown in the structure diagram illustrated in "b", which is statically determinate. If another diagonal brace member is placed in the structure as shown in "c", sufficient members have been included to prevent collapse under loading within the strength of the material. Note, however, that one more structural member has been included than is actually required. Consequently, that member is classified as "redundant." By the inclusion of the additional member, the structure is statically indeterminate. By removal of this redundant member, the structure again assumes the form of "b" and is again statically determinate. This practice is followed in the analysis of model airplane space frame work structures.

The basic loads imposed upon the model airplane structure differ from that of the full scale airplane. Whereas in the full scale airplane, air loads imposed upon the wings and then transmitted to the fuselage are first in importance, the greatest load imposed upon the model airplane structure is that incurred during a hard landing. The critical condition occurs where the wheels bank into an obstruction. This produces an instant reaction backward and upward through the struts, which comprise the landing gear and transmits these forces to the structure.

Frequently the model airplane tends to nose over during a hard landing. The sudden impact force thus generated is transmitted to the lower longerons at the joint or attachment where the landing gear is joined to the structure. If a rigid type attachment is used, the impact loads are transmitted and distributed throughout the entire fuselage structure. It is necessary to employ a type of construction which distributes the loads through the joint of attachment of the landing gear to longitudinal, vertical, and diagonal members. Frequently, structural members are reinforced with balsa on the side through which the impact loads will be transmitted to the adjacent structure.

Model airplane structures should be designed primarily to survive hard landings. It is advisable to attach the wing with a rubber band, and to use a resilient piano wire landing gear in place of one that is rigid. Such shock absorbing devices tend to relieve the fuselage structure of large impact loads. The engine, batteries, ignition coil, timer, and other engine units should be mounted upon a structure composed of rigid stringers which are attached to the fuselage. Joints of high efficiency should be used which will distribute all loads originating from the engine operation and vibration throughout the structure. In other words, the stress analysis should be made from a practical standpoint.

Basic Loads

The basic loads in the sequence of importance which are imposed upon the structure of a model airplane are as follows:

1. Landing loads.
2. Torque loads.
3. Compression loads imposed upon the fuselage.
4. Vibration.
5. Concentrated weight.
6. Air loads.

Landing loads and torque loads are of primary importance, whereas other loads are of secondary importance. In contrast to a full scale airplane, the air loads imposed upon the model airplane structure are of minor importance in comparison to landing and torque loads. Therefore, the critical structure which requires primary investigation of the loads imposed is that of the fuselage. The followng basic

(Continued on page 42)

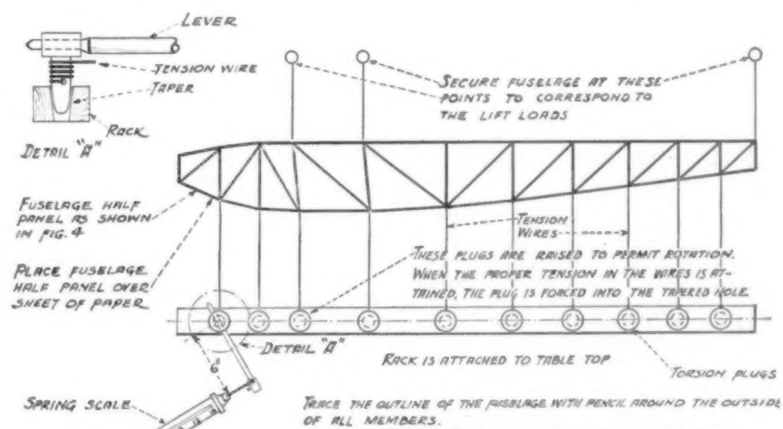
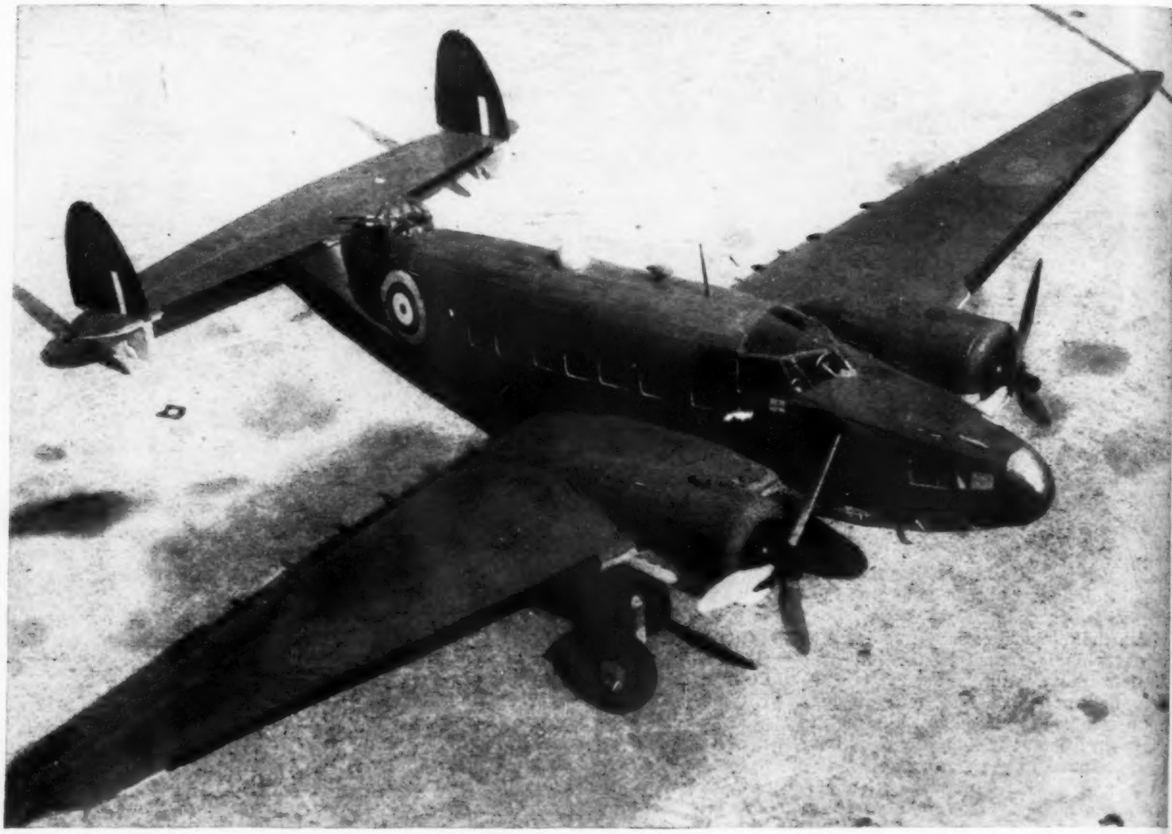


Fig. 7—Method of fuselage panel static test to determine actual failure loads



Lockheed Hudson, work of Byron Thompson, Jr., Grand Forks, N. Dak., has movable turret, dual controls and shock absorbing gear

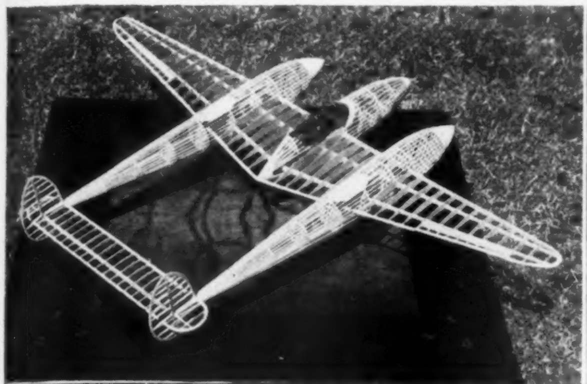
LeRoy J. Nessen's successful Flying Wing with flat glide and satisfactory stability

AIR WAYS

News of model plane experimenters from all parts of the world

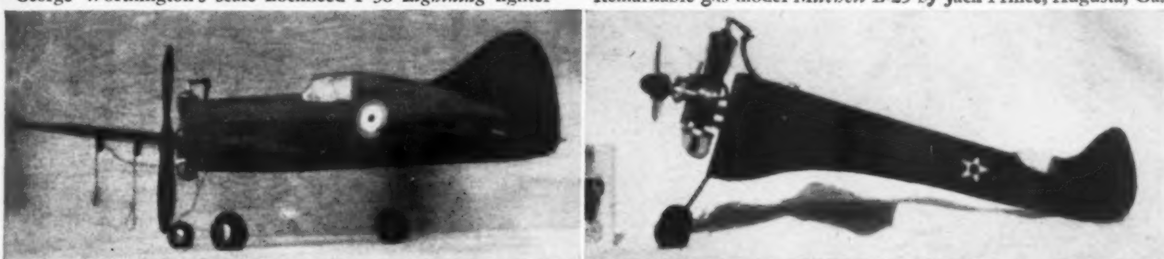
Old Timer Dick Ealy, Los Angeles, Calif., designed and built this original job with metal engine mount, streamlined struts and 68" span

Supermarine *Spitfire* control line model is the craftsmanship of Bob Smurithwaite of Baker, Oregon, and has special propeller design

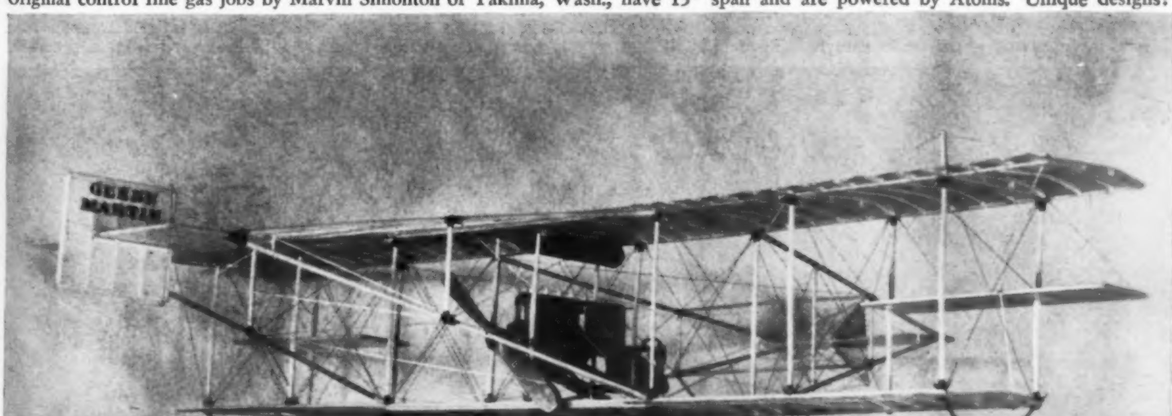


George Worthington's scale Lockheed P-38 *Lightning* fighter

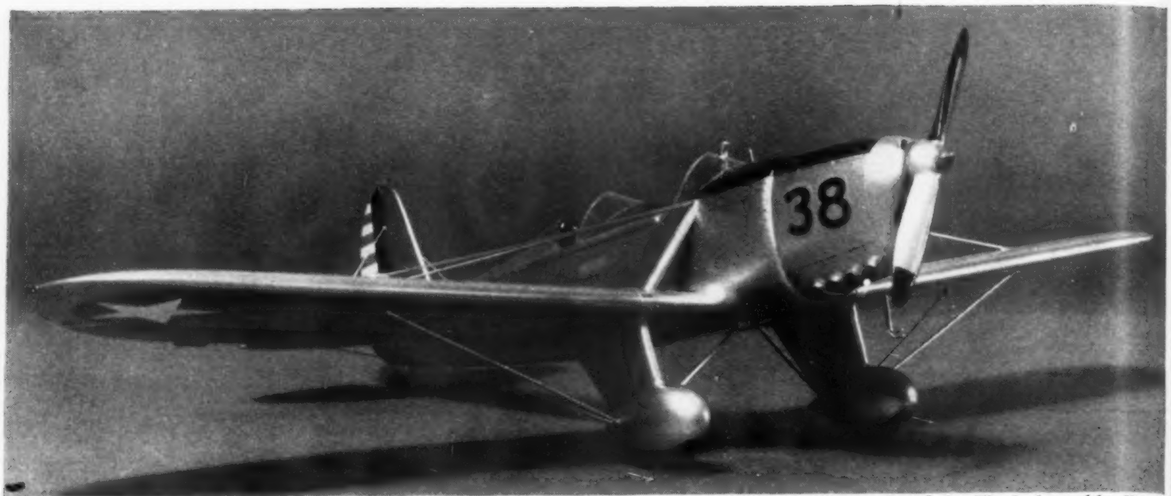
Remarkable gas model *Mitchell* B-25 by Jack Prince, Augusta, Ga.



Original control line gas jobs by Marvin Simonton of Yakima, Wash., have 15" span and are powered by Atoms. Unique designs!



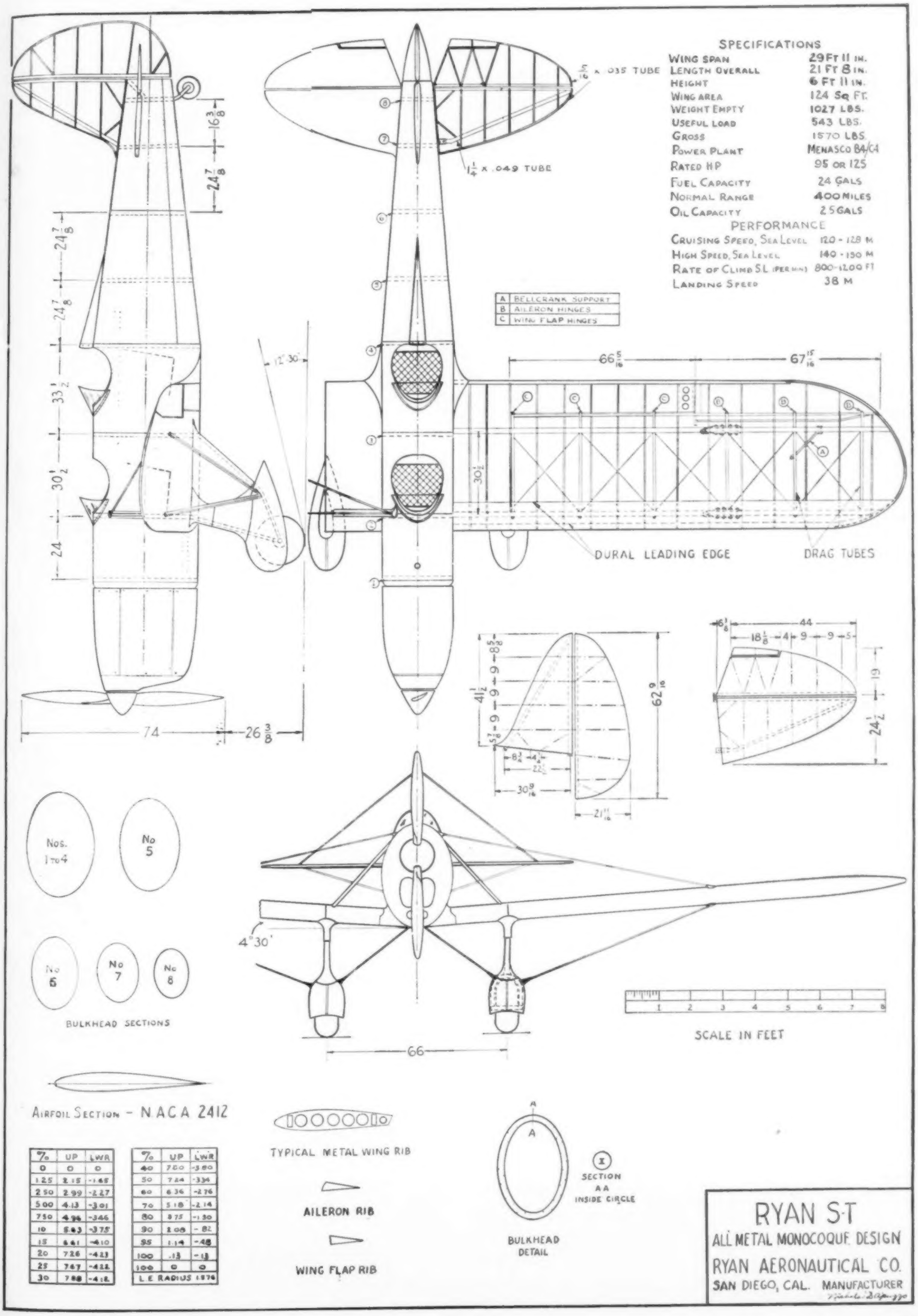
R. S. Nevin took 500 hours to build this amazingly detailed scale model of 1909 Glenn Martin ship. He plans set of Martin ships



Jess Larsen, Jr.'s Ryan PT-20 detail scale model is on display at Ryan company where he is employed in Final Assembly Dep't

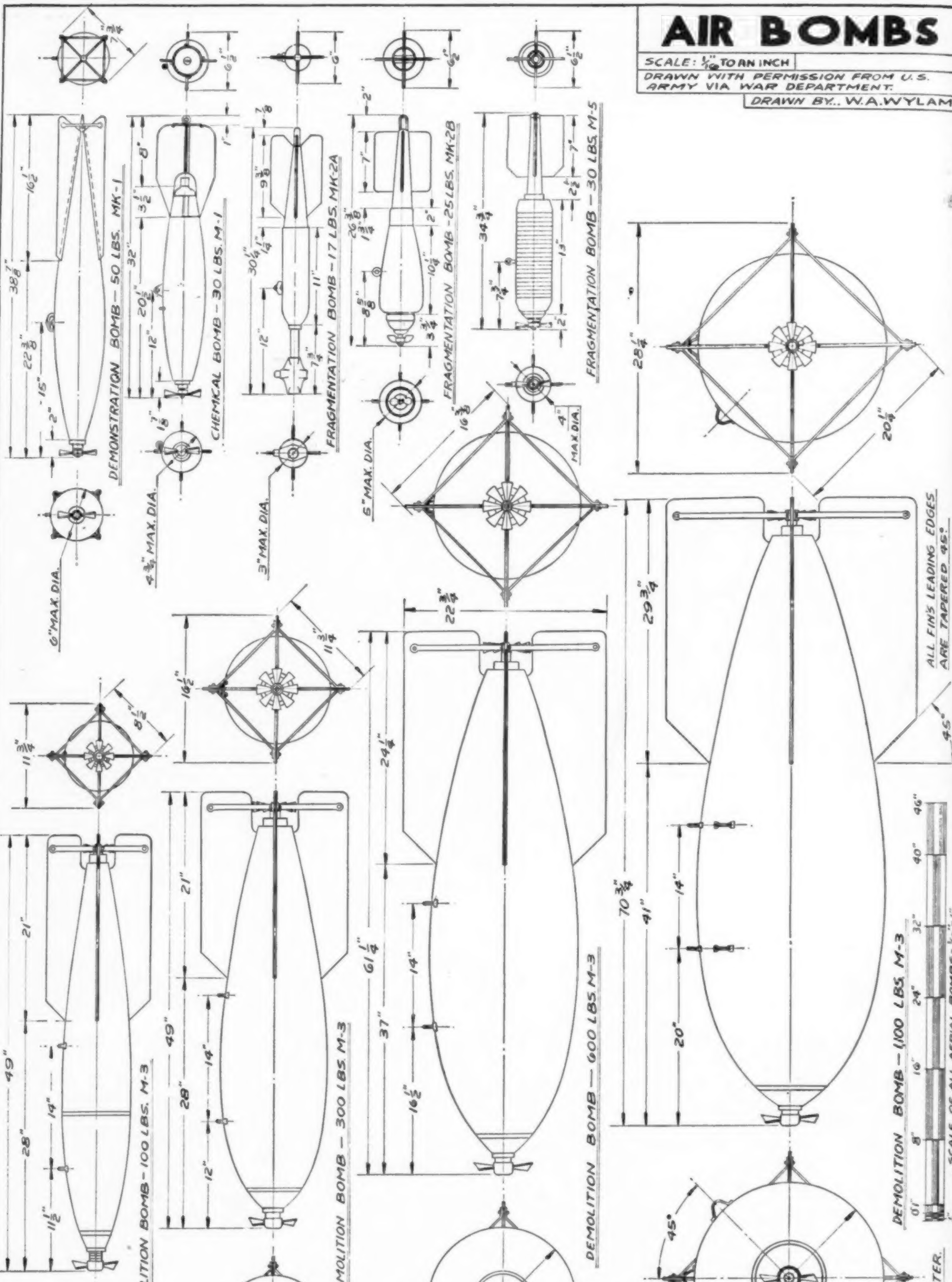
Miss Tiny is work of Lester McBrayer, Glendale, Calif., who has a seaplane version launched and recovered from a speedboat

University of Toronto student Frederick F. Roberts built this finely detailed scale model of the Republic P-47 Thunderbolt



%	UP	LWR
0	0	0
1.25	2.15	-1.65
2.50	2.99	-2.27
5.00	4.13	-3.01
7.50	4.96	-3.46
10	5.63	-3.75
15	6.61	-4.10
20	7.26	-4.23
25	7.67	-4.22
30	7.88	-4.12

%	UP	LWR
40	7.80	-3.80
50	7.24	-3.34
60	6.36	-2.76
70	5.18	-2.14
80	3.75	-1.50
90	2.08	-.82
95	1.14	-.48
100	.13	-.13
100	0	0
L.E. RADIUS 1.576		


AIR BOMBS
SCALE: 1/16" TO AN INCH
DRAWN WITH PERMISSION FROM U.S. ARMY VIA WAR DEPARTMENT.
DRAWN BY... W.A.WYLAM
DEMONSTRATION BOMB — 50 LBS. MK-1
CHEMICAL BOMB — 30 LBS. M-1
FRAGMENTATION BOMB — 17 LBS. MK-2A
FRAGMENTATION BOMB — 25 LBS. MK-2B
FRAGMENTATION BOMB — 30 LBS. M-5
6" MAX. DIA.
4 3/4" MAX. DIA.
3" MAX. DIA.
6" MAX. DIA.
4" MAX. DIA.
ALL FIN'S LEADING EDGES ARE TAPERED 45°.
DEMOLITION BOMB — 100 LBS. M-3
DEMOLITION BOMB — 300 LBS. M-3
DEMOLITION BOMB — 600 LBS. M-3
DEMOLITION BOMB — 1,100 LBS. M-3
SCALE OF ALL AERIAL BOMBS - 1/16" = 1"
7 1/2" M.D.
12" M.D.
16 3/4" M.D.
21 3/8" M.D.
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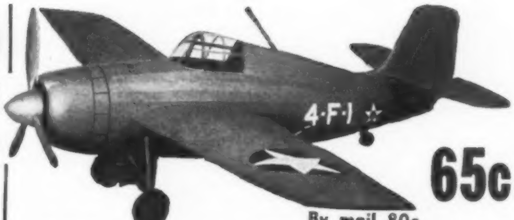

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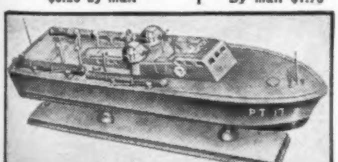

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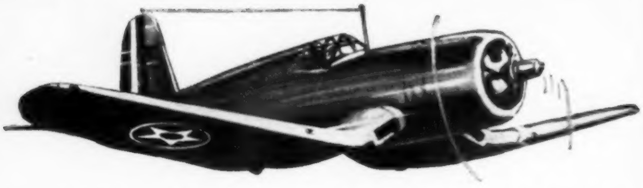

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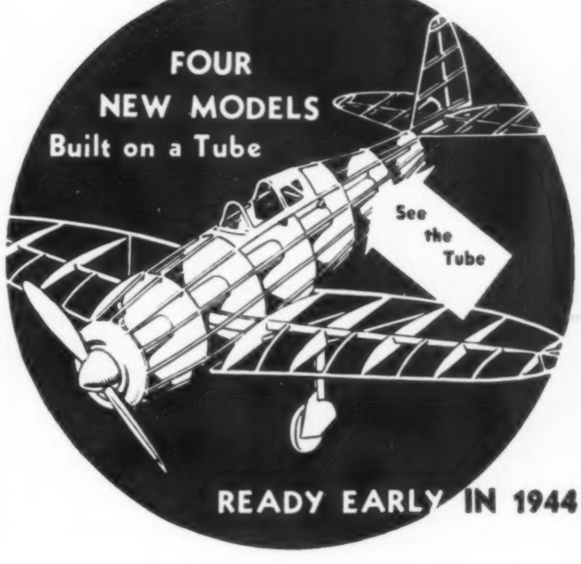

Four brand new kits with Ott-O-Former and Ott-O-Tube time-saving construction are now in preparation. Many of you have asked for these models—an Army fighter—a Navy fighter—two enemy fighters—and they will soon be ready.

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Performance of U. S. Combat Planes

(Continued from page 7)

the plane the *highest ceiling* (up to 40,000 feet) and the *highest speed* (well over 400 miles an hour) of any fighter in existence.

The A-36 *Invader,* the fighter-bomber version of the P-51, has seen heavy service in the Mediterranean theater, and its best features are being incorporated in the new P-51, which will replace both the A-36 and the old P-51. On August 1, the 36th anniversary of the United States Army Air Forces, Lieutenant-General Carl Spaatz gave special credit to the A-36 for its work over Sicily, saying it has "proved to be a great success in bombing and strafing the enemy tanks, troop concentrations and shipping." Always known as *Mustangs* by the British, P-51's have been successfully used by them in raids over the continent. They took part in the raid on Dieppe, and were the first single-engined planes based in Britain to penetrate Germany proper. The RAF have acclaimed the *Mustang* as the finest Army Cooperation Scout in the world. The new *Merlin*-powered North American P-51 *Mustang* is expected to be the equal of the *Lightning.*

Bell P-39 *Airacobra*

Although in the latest model P-39 ceiling and general performance have been improved, the P-39 has shared the climb-deficiency of the P-40. It has, however, been used successfully on a wide variety of fronts, including Russia, New Guinea and the Solomons. It is being supplanted by a new model now under construction, with a low drag wing and two-stage Allison supercharged engine which will make it an efficient plane at any altitude up to 38,000 or 40,000 feet. The greatest efficiency of the P-39 models has been below 15,000 feet. Like the P-39, the new plane will be equipped with cannon as well as machine-guns.

About half the total production of P-39's has gone to Russia, where the plane has been particularly effective as a ground-strafing tank-buster in all campaigns from Stalingrad to present operations. In one three-month period a Soviet Air Force Guards group knocked down 33 German planes at the cost of three P-39's, and there is a veteran P-39 flying in Russia today with 31 stars painted on its fuselage, one for each German plane it has destroyed. On August 15, over New Guinea, a force of *Airacobras* downed three *Zeros* and eleven Jap bombers, losing three of its own planes.

Curtiss P-40 *Warhawk*

In the opinion of the Materiel Command this famous plane has reached the limit of its developmental possibilities, and after this year it will be produced only in limited quantities, for operational training and for replacement in theaters where they have proved highly successful.

The basic P-40 was designed before the war, and was the only fighter in quantity production when the Japs struck at Pearl Harbor. It has gone through numerous type changes, the most basic being the P-40F when the engine was changed from Allison to *Merlin.* From the F to the latest model, the changes have been minor.

In all types and over every front the P-40 has made history—and is still making it, although newer fighters excel it in speed and climb. Equipped with light bombs for destruction of ground objectives, P-40's helped stop Rommel's drive in Egypt in the summer of 1942. P-40's ran up the big box score in China, downed the 58 Axis troop transports in the famous battle off Tunisia, and were kept busy over Sicily and Kiska. On July 22, in a contest over Southern Sardinia between 45 P-40's and 25 to 30 enemy fighters, the P-40's shot down 17 of the enemy with a loss of only two of their own number. But in the case of the P-40, these highlights are less important than the fact of its long, steady performance in all climates and over all terrains, from the Russian steppes to the swamps of New Guinea.

Heavy Bombers

In the heavy bomber class, our Boeing B-17 *Flying Fortress* and Consolidated B-24 *Liberator* are superior to Germany's Focke-Wulf 200 K *Kurier* and Heinkel 177. The Japanese do not have any land-based 4-engine heavy bombers. Despite their increased bomb capacities and their increased defensive armament, and despite the destruction they are carrying to Europe and more distant points, the big B-17 and B-24's are now sometimes referred to in the Air Forces as "the last of the small heavies." Already in production and scheduled for entry into combat by the spring of 1944 is a considerably larger and more potent bomber which will eventually replace the B-17, at least for long-range work.

The newest models of both the Boeing B-17 *Flying Fortress* and the Consolidated B-24 *Liberator* bombers are equipped with new defensive armament in the form of nose turrets with machine gun installations. External bomb-racks can increase the potential bomb capacity of the B-17 to 17,600 pounds. Nevertheless, this plane has a smaller bomb capacity at long range than the B-24. The most accurate comparison, perhaps, is to say that loaded with 2,800 gallons of gasoline the B-17 can carry 6,000 pounds of bombs (the usual load carried over targets in Western Europe), whereas the B-24, with 2,900 gallons, can carry 8,000 pounds of bombs. Consequently the B-17 is being concentrated in the Western European theater and the B-24 is being used chiefly elsewhere—in the Middle East, in India, China and Australia—for longer range operations. B-24's have made round-trip flights up to 2,600 miles; the raid on the Ploesti oil fields in Rumania from bases in Egypt, the raid on the Messerschmitt works at Wiener-Neustadt, and raids in the Pacific to Wake, Paramushiru and Surabaya. The B-24 is used by the Navy under the designation PB4Y-1, for land bombers in the South Pacific and for anti-submarine warfare.

The B-17, with its Wright Cyclone engines, and the B-24, with its Pratt &


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Whitneys, have set an unrivalled record for large-scale, precise, daylight destruction of enemy targets. The past year has proved to the hilt the validity of the American theory of precision daylight bombing which aims to destroy key parts of highly strategic industries such as fighter aircraft factories, oil and rubber plants and power installations. Heavy night-bombing of European targets continues to be accomplished chiefly by British *Lancasters* and *Halifaxes.*

Medium and Light Bombers

In the medium bomber class, our North American B-25 *Mitchell* and Martin B-26 *Marauder* continue to be the world's best medium bombers. Their closest competitors are Germany's Dornier 217 E and Japan's Nakajima 97 *Kate* and Mitsubishi 01 *Betty.* In the light bomber class, the Douglas A-20 *Havoc* is in a class by itself. The Germans have nothing to compare with it; the Japs' Mitsubishi 99 *Lily* is not as fast, rugged or heavily armed as the Havoc.

To an ever-increasing extent strategic bombing is being done by larger bombers with longer range, while bombers of smaller size are entering the attack bomber category, and are being used for tactical work. This is not to say that medium bombers do not continue, for example, to carry out strategic raids on targets in France, Belgium, Holland, and Italy but for missions of this kind larger bombers are being increasingly used, whereas small and medium bombers operate increasingly at low altitudes—often at tree-top height. Developments in the African campaign confirmed previous forecasts of this trend. Closely related to this development is the supplanting of dive-bombing by skip-bombing in the Army Air Forces. In skip-bombing, bombs with delayed action are released from tree-top level, sighting being done by the pilot rather than by the bombardier. The bomb hits the ground or water and then glances to the target, exploding when the airplane is out of range. Amazing accuracy has been achieved by this technique. An added element of surprise is injected into the attack, and safety is increased because in skip-bombing the bomb can be released when the plane is traveling at higher speed than in dive-bombing.

Improvements in our medium and light bombers follow the line of these combat developments. Increased armament, speed and range characterize the newest North American B-25 *Mitchell.* The latest Douglas A-20 *Havoc* is equipped with greatly increased defensive firing facilities and with provisions for more effective group strafing. The best characteristics of the North American A-36 *Invader,* the fighter-bomber version of the North American P-51 *Mustang* which did so well in Sicily, are being retained in the new model. In addition to these improvements on already existing planes, a totally new light bomber is at present in the stage just preceding production. This plane, described by the Materiel Command as "three or four years ahead of the A-20," will be an all-purpose plane equipped with a powerful cannon and with interchangeable noses for various types of operations.

North American B-25 *Mitchell*

New models of this two-engine Tokio raider are equipped with heavier armament and possess increased speed and range. The B-25 is the chief medium bomber in the present program, production of the Martin B-26 *Marauder* being tapered off. B-25's powered with Wright *Cyclone* engines are flying on eleven fronts, are used by both Army and Navy for anti-submarine patrol service, and have scored particular successes with skip-bombing.

Martin B-26 *Marauder*

Despite its high speed, good load capacity, and excellent combat performance in several theaters, notably in New Guinea, the Mediterranean, and Europe, the production of this plane is being tapered off for four major reasons: Air Forces' policy is to reduce the number of models, concentrating production on highest performance types in a combat classification; the B-26's performance with one of its two motors shot out is not as good as a B-25's; it can not be used out of smaller airports because of high landing and takeoff speed; and its maintenance is more difficult than the B-25's. Changing demands of tactical operations also entered into the decision to use trained Martin personnel and factory space for production of other more urgently required bomber types.

Douglas A-20 *Havoc*

This is the principal light Army bomber in the program until the totally new, advanced light bomber mentioned above comes into production. The newest *Havoc,* used by the Army for low-level bombing, is fitted with a power turret and with armament for ground strafing. A-20's, powered with Wright *Cyclone* engines, are highly versatile, and have been active over Tunisia, Australia and New Guinea. A-20's are widely used by the RAF under the designation *Boston.*

The A-24, Army version of the Douglas SBD *Dauntless* dive-bomber, is now being produced in decreasing numbers, chiefly for training purposes.

NAVAL AVIATION

Fighters

The Navy's fighter program is large. An airplane carrier carries torpedo planes, bombers and fighters, and of these the fighters are needed to protect the other planes and the carrier itself. Fighters also protect land bases. In the South Pacific, Army P-38's are doing this latter job along with Navy fighters. It may be noted that the Brewster F2A *Buffalo,* veteran of the Battle of Midway and other Pacific actions, was discontinued some time ago in favor of more advanced fighters.

The Navy's *Corsair* and its brand new *Hellcat* are far superior to anything the Japs have to offer so far. They are both in the 400 m.p.h. class and have high performance. The latest and best of the Jap fighters is a Mitsubishi 03 *Tony,* which is the latest version of the Jap

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X-6. . .Lockheed "Lightning"

X-7. . .Grumman "Wildcat"

X-8. . .Grumman "Skyrocket"

X-9. . .Westland "Lysander"

X-10. .Focke-Wulf

X-11. .Henschel

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Zero. Unlike the original *Zero* (Mitsubishi 00) and its later version, the *Hap* (Mitsubishi 00 MK-2), the *Tony* has some armor protection for the pilot and more fire power. But it is definitely inferior to the *Corsair* and the *Hellcat* both in safety and performance characteristics. None of the Jap fighters are in the 400 m.p.h. class.

Vought F4U *Corsair*

The *Corsair* has a 2,000 horsepower Pratt & Whitney engine and is easily distinguishable by its inverted gull wing. The *Corsair* has recently been the chief Navy fighter in the South Pacific. *Hellcats* are beginning to join it in large numbers. In all departments of combat performance it has shown superiority to all models of the Jap *Zero*—higher speed, faster rate of climb, and far greater ability to absorb punishment. On April 25, four U. S. Marine Corps pilots, flying *Corsairs,* encountered 40 or more Jap planes, shot down six and lost two, all but one pilot returned safely. This plane is also being made by Brewster, with the designation F3A, and by the Goodyear Aircraft Corporation with the designation FG1.

Grumman F6F *Hellcat*

The newest member of the Navy's fighter family is described by the Navy as "an answer to the prayers of our pilots for a plane which can fight the *Zero* on any terms." A big brother of the famous Grumman *Wildcat,* the *Hellcat* has better range, speed, climb, maneuverability and altitude. It has a 2,000 horsepower engine as compared with the *Wildcat's* 1,200. It has a low wing, improved armor, and a new flexible type gasoline tank which is an improvement over the ordinary puncture-proof type. It carries .50 caliber machine guns and has plenty of additional space for ammunition for prolonged air battles.

The *Hellcats* saw their first action on September 1, when they accompanied Navy bombers on an attack on Marcus Island in the Pacific. However, they didn't get a chance to test their mettle against Jap *Zeroes*—because all the *Zeroes* were destroyed on the ground by our bombers. The Navy is enthusiastic about the potentialities of the *Hellcat.*

Grumman F4F *Wildcat*

This Navy fighter, with Pratt & Whitney *Twin Wasp* air-cooled engine and with folding wings for compact stowage on aircraft carriers, has run up many high scores in Mediterranean, Atlantic and Pacific fighting. Despite its limitations of speed and ceiling, it has maintained a consistent advantage of at least five to one over Japanese aircraft, mainly by use of superior tactics. Notable was the battle of June 16, when a Jap air armada attempted to attack Guadalcanal; 94 Jap dive-bombers and fighters were smashed, against a loss of six *Wildcats.* The F4F will continue to be manufactured for use on auxiliary carriers and for training.

Patrol Bombers

Chief among the Navy's patrol bombers are three flying boats and two land planes. The land planes are the Consolidated PB4-1 and the Vega PV-1. The flying boats are the Consolidated PBY *Catalina,* Consolidated PB2Y *Coronado,* and Martin PBM *Mariner.* All three flying boats are used for transport purposes as well as for patrol and bombing operations. The two-engine PBY, the oldest, slowest and smallest, the ship which first spotted the Jap forces on the Aleutians, is still being built, still dive-bombing and strafing enemy shipping and rescuing pilots who have been downed at sea. The four-engine PB2Y has double the horsepower of the PBY. The PBM does good work in anti-submarine coastal patrol and long-range reconnaissance. Not even the newest Navy flying boats have speeds much above 200 miles an hour, but all are required to be able to land in a choppy sea with four to five foot waves.

The Navy's Consolidated PB4Y-1 (similar to the Army *Liberator*) and the Vega PV-1 have greater range and load capacity than the best Japs have in this group, the Mitsubishi 01 *Betty,* the Mitsubishi 97 *Sally* and the Mitsubishi 96 *Nell.*

The Navy's Martin *Mariner* PBM-3 and Consolidated *Catalina* PBY-5 have a range of 3,000 miles compared with the Jap Kawanishi 97 *Mavis* with a range of 2,100 miles and an even greater superiority over the Jap plane in bomb load capacity. Range and bomb load capacity are the two most important characteristics in a patrol bomber and the American planes have a wide edge in both.

The Consolidated PB4Y-1 is a 4-engine land-based bomber and, as previously mentioned, is used for long range bombing missions and for anti-submarine patrol work.

The Vega PV-1 (a Navy adaptation of the twin-engined Vega B-34 *Ventura* bomber) is the Navy's chief land-based anti-submarine patrol plane. It carries depth charges or a torpedo, is heavily armored, and is now often used in preference to flying boats in anti-submarine operations because of its greater speed.

Scout Bombers

Dive-bombing plays an important role in Navy attack operations. In attacking an enemy task-force, dive-bombers are

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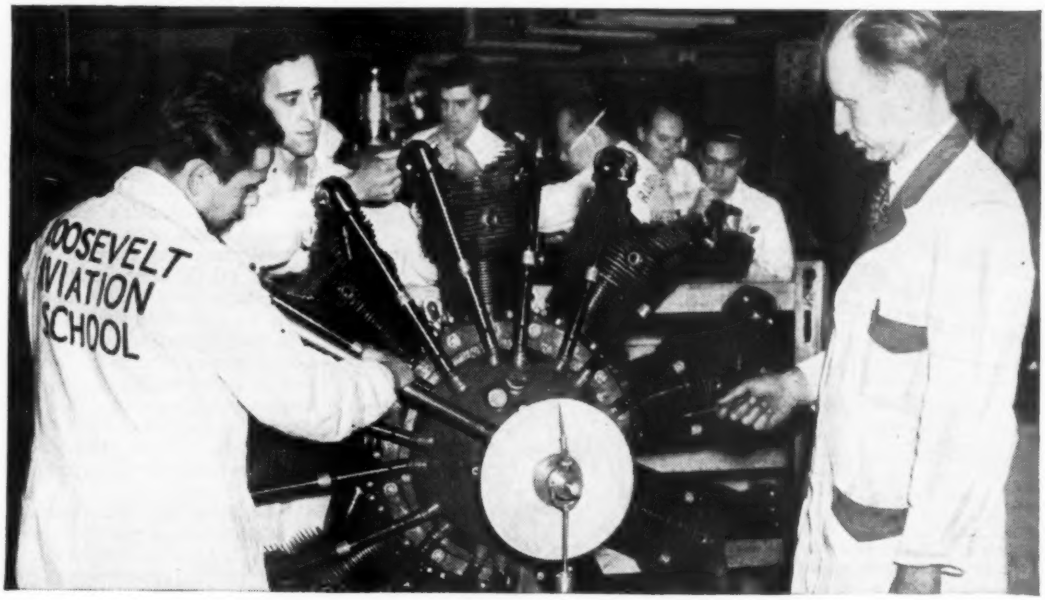

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used to force the ships into certain maneuvers; and to cripple them; then torpedo planes come in for the kill. Much heavier fighter protection exists for both dive-bombers and torpedo-bombers now than at the time of our earlier Pacific operations. Skip-bombing in the Navy is employed against less heavily guarded targets.

Douglas SBD-*Dauntless*

The Navy's *Douglas Dauntless* SBD-3 can get into a steeper dive, is more rugged, and has better armor than the Japanese dive-bombers, the Mitsubishi 01 and Mitsubishi 97. The range and bomb capacity of the planes are about the same. The Navy's new Curtiss *Helldiver* has longer range, more speed, and greater bomb capacity than the *Dauntless* but has not yet seen combat experience.

Improved SBD's with increased horsepower and armament have gone into combat areas in large numbers. They have dive-bombed many a Jap vessel to the bottom and destroyed many fighters.

On some occasions in the Pacific, SBD's have taken on jobs more properly done by fighters, as for instance acting as patrol against Jap torpedo and dive-bombers. In some of these engagements the SBD's have suffered heavily from the Japs' fighter escorts; in others they have made brilliant scores.

Curtiss SB2C *Helldiver*

A very promising dive-bomber is the Curtiss *Helldiver*, SB2C, which has been under development for some time and which has longer range, more speed, and greater bomb capacity than the Douglas *Dauntless*.

Torpedo Bombers

The Navy's Grumman *Avenger* TBF-1 is outstanding. However, the Japs are coming out with a new torpedo bomber. It is a twin-engine, carrier-based, plane. The Japs have been using the Mitsubishi 01, a land-based plane, as a torpedo bomber. It is inferior to the *Avenger*.

Grumman TBF *Avenger*

This is the Navy's carrier-based torpedo-bomber, which has completely supplanted the Douglas TBD *Devastator*. It carries machine guns as well as torpedo or bombs, and has destroyed many Japanese vessels in the Pacific.

Observation Scouts

Navy's observation scouts are the Vought *Kingfisher* OS2U-3 and the Curtiss *Seagull* SO3C-2. They are used principally on cruisers and battleships for patrol and observing naval artillery fire. These Navy observation scouts were used effectively in the African and Sicilian campaign in spotting positions of tanks, guns, trucks and other enemy equipment and reporting it to naval craft for bombardment.

VICTORY

Mitchell Cannon Fighter

(Continued from page 17)

commodate the cannon installation, a new and shorter nose structure was designed for the new B-25 to replace the glass-enclosed bombardier's compartment. In addition it was necessary to relocate the controls from the forward compartment to the pilot's campartment, revise the navigator's compartment, and add armor plate for protection against frontal fire.

In making their tests, engineers took an entire section of a B-25 forward of the wings and installed the cannon. This section was then moved to a firing range located at the foot of a hill and the firing tests made. The experiments were completed successfully in approximately two months' time.

Production on the cannon-equipped B-25's started at the California division of North American approximately three months later. It required 13,551 engineering manhours and 380 new drawings to complete the job of redesigning the airplane.

A total of 2000 pounds has been added to the airplane's gross or loaded weight by its tremendous armament installation and the ammunition it must carry.

The cannon, built on a mount assembly, is installed in what was formerly a passageway beneath the left side of the pilot's compartment. The muzzle projects forward through a blast tube in the lower nose section and the breech extends aft to the left forward side of the navigator's compartment.

Two fixed .50 calibre machine guns also have been placed in the nose of the bomber.

Crew of the B-25 consists of pilot, co-pilot, cannoneer, radio operator and upper turret operator. The guns—both the machine guns and cannon—are charged and fired by the pilot.

Although a number of American aircraft manufacturers were invited by the War Department to adapt twin engine airplanes to carry the 75 millimeter gun installation, the B-25 is the first such airplane to be manufactured and to see action. The largest weapon installed in an airplane prior to this time is believed to be the 40 millimeter cannon used by the British to arm the Mustang, Spitfire, and Hurricane.

Despite the addition of the cannon, the B-25's still retain their effectiveness in dropping bombs, troop-strafing, carrying torpedoes, acting as reconnaissance planes, serving as transports, and as fighters.

The new installation has not affected the B-25's bomb bay capacity or its speed.

Questions and Answers Concerning the 75 mm. Cannon Installation

Q. What is the purpose of so large a cannon in a plane?

A. Some targets are more vulnerable to shells fired at their sides than to bombing.

Q. What was the effect of the 75 mm. cannon when first used?

A. Complete surprise for the enemy. B-25's came in low over the water to attack ships, and over housetops to attack gun positions, and were away before they could be fired on effectively.

Q. Is the 75 mm. cannon-plane effective against medium and heavy tanks?

A. One hit from the 75 will knock the tread off any tank and halt it. Light tanks are practically turned inside out by a hit from a 75.

Q. How large a ship could the 75 mm. projectile sink?

A. The largest ship attacked, as yet reported, was a Jap destroyer in the Southwest Pacific, and it was sunk with the aid of bombs dropped by other B-25's.

Q. Are there special land objectives against which the 75 mm. cannon plane can be used effectively?

A. It has been used with accuracy to blow up narrow bridges, which are often difficult to bomb from high altitudes. Any objective which is invulnerable from overhead attack could conceivably be attacked horizontally.

Q. How is the 75 mm. cannon fired?

A. It is fired by the pilot, who presses a button on the wheel when he has his target in his sights and in range.

Q. How fast can it be fired?

A. It can be reloaded in a matter of seconds. It can be fired so rapidly that the first shell will still be in the air when the second one is fired. North American engineers fired three shots in 10 seconds during tests.

Q. Could a cannon-carrying Mitchell damage a battleship?

A. Yes, in several ways. A battleship's central fire control could be knocked out by a direct hit, or could be damaged by a close hit. Secondly, a direct hit on an anti-aircraft gun would put it out of operation.

Q. In what other ways could ships be damaged?

A. Any transport could be made helpless by a hit on the propeller, or if only the rudder were hit it would be slow to maneuver. Horizontal attack makes such damage possible.

Q. Could a battleship be damaged in this way?

A. Yes. A direct hit could wreck one propeller, and make the heavy ship an easier prey for bombers or surface craft. Horizontal attack against a battleship from either side has certain advantages over vertical attack.

Q. Are these "aerial artillery planes" being produced in volume?

A. All the B-25's manufactured at the California division have the cannon installation, and many other B-25's have received cannons at the North American Modification Center at Kansas City.

VICTORY

Stress Your Gas Job

(Continued from page 25)

facts should be recognized by the builder:

1. In most instances of fuselage construction, the fuselage must be made overstrong to react to high impact loads in contrast to the light air loads transmitted to the structure.
2. If the structure is of sufficient strength to resist engine torque and landing loads, air loads may be disregarded.
3. The number of redundant members should be kept to a minimum to obtain a high strength to weight ratio.
4. The heaviest concentrated weights are the engine, ignition coil, and the dry batteries.
5. The resistance to localized imposition of loads is a function of the efficiency of the glued, doweled, or nailed joints.

The initial procedure in the stress analysis of a model airplane fuselage is to determine the various weights that will be supported by the structure. This is necessary in order to determine the forces present in each member of the fuselage. These forces will assume the disposition of parallel forces. The determination of the resultant of the forces in the fuselage will establish the center of gravity of the structure through which the line of action will pass. Each of the individual loads imposed upon the fuselage must be multiplied by a suitable load factor. This is necessary to provide a reasonable margin of safety, and yet maintain a high strength-to-weight factor. The margin of safety permits the imposition of loads beyond the normal amount during hard landings, and when the model aircraft is subjected to accelerations arising from flight maneuvers in turbulent air.

Graphical Fuselage Load Analysis

Utilizing the foregoing data, let us proceed with the determination of the center of gravity of the fuselage structure, which is loaded according to Fig. 2. A load factor of 4 has been selected as being adequate and is based upon an empirical assumption for providing an adequate margin of safety and also to allow a high strength to weight ratio. The actual loads imposed upon the fuselage have all been multiplied by 4 to obtain the amounts shown in Fig. 2. By the application of the process of graphic statics used for determining the resultant of a system of parallel forces, the resultant in this instance passes through a line 4½ inches aft of the forward end of the fuselage. This determination establishes the horizontal position of the center of gravity.

The determination of the center of gravity is made as follows:

a. Multiply each individual weight by its horizontal distance from the forward end of the fuselage.
b. Continue with each weight and obtain a series of moments.
c. The summation of the series of moments is the total horizontal moment.
d. Divide the total horizontal moment by the total of the individual weights.
e. The answer is the horizontal position of the center of gravity from the forward end of the fuselage.
f. The vertical position of the center of gravity may be obtained in a similar manner. This may be used for lateral stability calculations.

Location of Lift Force in Relation to Center of Gravity

After the determination of the center of gravity has been completed, the position of one of the five elementary loads imposed upon the fuselage structure should be determined. It is assumed that the position of the lift force is aft of the center of gravity.

The wing is attached at the bases of two members which determine the bay "c" of the fuselage structure as shown in Fig. 2. In order to determine the reactions at the bases of the two vertical struts, resort is made to a simple problem in graphic statics as illustrated in Fig. 3.

The total weight of the structure is laid off as the resultant in the force diagram, and is then resolved graphically into two component forces. Of these two forces, reaction R_1 will necessarily be the largest because it is located closer to the line of action of the resultant force. The sum of the reactions R_1 and R_2 is equal to the total weight of the structure. This condition is satisfied in this problem because $19\text{-}3/4 + 4\text{-}1/4 = 24$ pounds. (It should be remembered that these forces are all four times greater than the actual loads imposed upon the structure because a load factor of 4 has been previously applied.)

Load Factors for Model Aircraft Structures

The use of a suitable load factor should be considered where the model may be subjected to hard landings out of control. Balsa is difficult to obtain so that spruce or birch must be frequently substituted for structural members. In this respect, spruce and birch weigh four times balsa per cubic foot. But to offset the higher strength, birch has a lower stiffness factor per equal weight. Therefore, in order to obtain a high strength to weight factor, it is necessary to take into consideration the minimum load factor commensurate with the strength to weight ratio. The increase in weight of the structural members and the reduction in the stiffness for equal weights tends to increase the structural weight of a model airplane to such an extent that high performance always may not be possible. For normal model airplane design, a load factor of 4 should be used. This load factor allows plenty of margin of safety to the structure during a hard landing, and will not increase the weight beyond a prohibitive amount. When selecting the structural material the stiffness factor should not be ignored.

Development of Force Diagrams

When the weights or the external loads which are imposed upon the fuselage have been determined, and the distribution of each concentrated weight arranged, the internal stresses developed in the component members that comprise the structure may be determined by a graphical solution. Refer to Fig. 4. The truss structure shown is statically determinate.

The load line "nk" is first laid off. All of the known vertical forces are then laid off on it to the selected scale. All of the unknown forces may then be found by drawing lines on the force diagram parallel to the various members in which these unknown forces are assumed to act, from the extremities of the known forces in members to which they are joined in

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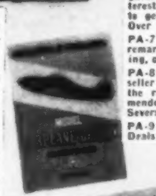

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the structure. The lengths of these lines when drawn to scale will represent the magnitudes of the internal stresses in pounds per square inch in the structural members. The condition under which the loads shown are assumed to act on the structure is that of the normal three point landing. This particular condition has been selected because in the case of a model airplane, it represents the critical normal condition that will be encountered other than a nose-over or a crash.

Selection of Structural Member Size

In order to select structural members of adequate size and structural characteristics to withstand the loads as determined by the graphical analysis, a few simple computations must be applied.

To select a specific problem, let us determine how large the dimensions of the longeron in the bay "cz" must be in order to possess sufficient strength to withstand the applied external loads. From the force diagram shown in Fig. 4, scale the quantity "cz," and note that it represents a force of 12-1/2 pounds. Preliminary to the actual determination, select a wooden longeron of rectangular section with a width of 1/4 inch, and a depth of 1/4 inch. Then subject this member to a trial analysis.

A longeron is essentially a column because it is subjected to bending and compressive loads. The Rankine Column Formula is used to solve for the loads as follows:

Rankine Column Formula:

$$P = \frac{f\,A}{12 + a\left(\frac{L}{k}\right)^2}$$

where "P" represents the safe load capable of being supported by the member, "f" represents the modulus of rupture of the material of which the member is constructed, "A" represents the cross-sectional area of the member, "a" represents a factor the magnitude of which is dependent upon the physical characteristics of the member, and the quality $\left(\frac{L}{k}\right)$ represents the slenderness ratio, or the ratio of the length of the column to its width or diameter. Assume that the column is made of spruce, the modulus of rupture of which is 9,400 pounds per square inch. E is modulus of elasticity of spruce and is 1,300,000.

The cross-section area of the column is equal to:

$$1/4 \times 1/4 = 0.0625 \text{ sq. in.}$$

The quantity k is then equal to:

$$0.0625 \times 0.3 = 0.01875$$

and $\left(\frac{L}{k}\right) = \frac{3.0}{0.018} = 170$ and

$$\left(\frac{L}{k}\right)^2 = 28{,}900$$

$$a = \frac{f}{\pi^2 E} = \frac{9{,}400}{9.4 \times 1{,}300{,}000} = 0.0008$$

Then: $a\left(\frac{L}{k}\right)^2 = 0.0008 \times 28{,}900 = 23.12$

Note: $\pi = 3.1416$

Substituting the quantities derived from the original formula:

$$P = \frac{9{,}400 \times 0.0625}{1 + 23.12} = 24.1 \text{ pounds}$$

The available margin of safety: $\frac{24.1}{12.5} = 1.92$. This is ample for any flight condition which will be encountered. A smaller section could be investigated and would be adequate for the purpose, although the section selected approaches the minimum size for workability and fabrication.

Employing the same process of analysis, the required dimensions for the vertical strut "tu" may be determined. Select a spruce section of 1/4 inch width and depth. We can then utilize several of the quantities already derived in the previous computations. The load on member "tu" is scaled from the force diagram of Fig. 4 as 23.75 pounds. The quantity $\left(\frac{L}{k}\right)$ in this case becomes equal to: $= \frac{2.4375}{0.01875} = 135.$

and $\left(\frac{L}{k}\right) = 18{,}225$

then: $a\left(\frac{L}{k}\right)^2 = 12.75$

Substituting: $P = \frac{9{,}400 \times 0.0625}{L \quad 12.75}$

$= 42.33$ pounds

The margin of safety equals $\frac{42.33}{23.75} =$ 1.73, which is ample to cover all flight and landing conditions.

Engine Vibration

Because on most model gas engines, it is not possible to regulate the engine r.p.m. closely, engine vibration may be extremely critical and tend to vibrate the structure beyond a reasonable margin of safety.

In Fig. 5 is shown some typical suggestions for anti-vibration engine mounts. Such mounts should tend to reduce the engine vibration within a reasonable degree of safety for the structure.

Theory of Joints

The function of a joint is to distribute the loads imposed upon the structure in such a manner that no evident distortion of the structure is possible within the allowable strength of the materials. Refer to Fig. 6. Note that the neutral axes of all structural members should intersect in order to prevent the possibility of eccentricity which would tend to distribute the forces in an unequal proportion throughout the members which comprise the joint.

The following types of joints are used in model airplane structures in the manner of the importance and use:

1. Cemented or glued joints.
2. Pin joints using a brad or dowel for the connecting member.
3. Pin joints using a metal stud or bolt and nut.

The strength developed by a cemented joint, or a joint reinforced with gussets is a function of the cemented area, the adhesive qualities of the cement, and the porosity of the wood.

Where design considerations make it necessary to use a combination pin and cemented joint, make certain that sufficient edge distance is allowed. The edge distance should be not less than the 2 diameters of the brad and preferably more. The same precautions are necessary where a metal stud, dowel, or bolt and nut are used as the attaching member of a cluster of members comprising a joint.

Insofar as joint design is to be considered, a well designed joint where the members are all properly proportioned in relation to the imposed loads, the use of a reinforcing gusset is not always advantageous or desirable. A joint which is properly designed does not require the use of a reinforcing gusset. Make certain when constructing joints that all edges are plumb and square to the members which they intersect, and that no eccentricity is present. Joints when properly designed will usually fail only after the indiivdual column members have failed by buckling action due to being subjected to compression loads. Reinforcing gussets, however, are useful where it is desired to increase the gluing area necessary to increase the shear strength of the joint. However, the stiffness imparted to the joint by the gusset member should be disregarded in any strength calculation.

Static Testing of the Structure

A simple spring scale may be used ad-

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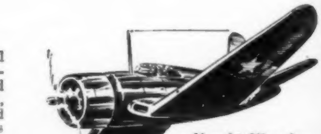

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A/C F.V.S. Jr., NATC, Pensacola, Fla.

"Just a note of thanks for the swell experience I have received from building Cleveland Models, which I have been doing for 7 years prior to my enlistment. I am in training now as a bombardier-navigator."
A/C C.C.J., AAFCC, San Antonio

"I am a student of the Boeing B-17-F 'Flying Fortress' mechanics school, and each day while in school, I thank Cleveland Models for the many things they have taught me. Many instructors here have come back from combat zones, and they advise us to build models as much as possible."
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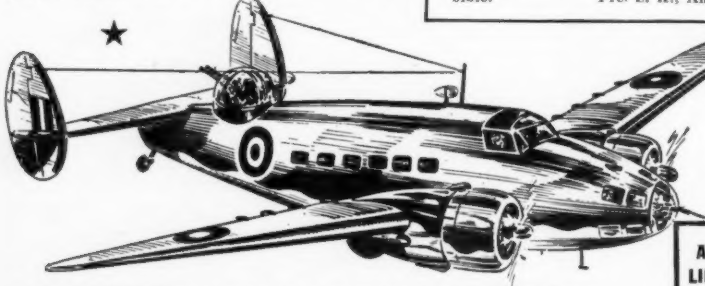

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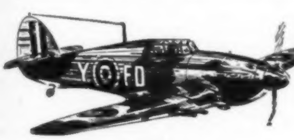

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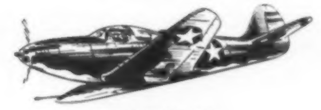
states Pfc. J. H. C., Quantico, Va.

Continuing, he says: "I have been building models ever since, and today that same model airplane experience has started my life work on the right road to success. I am only in the ground crew section, but my job is to help keep our planes 'upstairs,' and later on I hope to be made crew chief. I am proud that I am part of the Marine Air Corps who 'keep them upstairs,' and I want to thank you because it was Cleveland Models that taught me construction and patience and my future life work."



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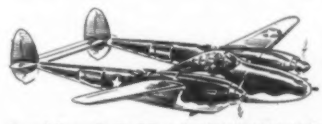

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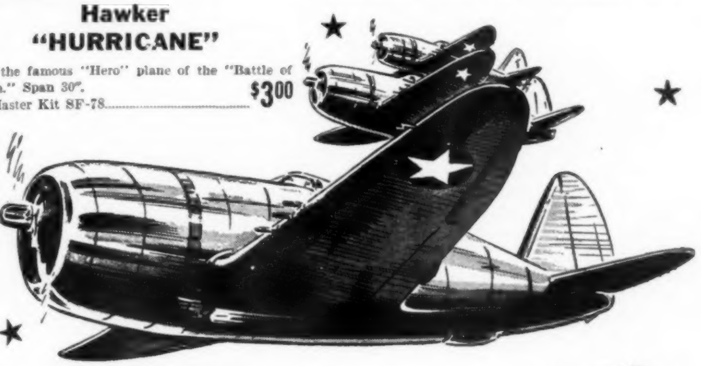

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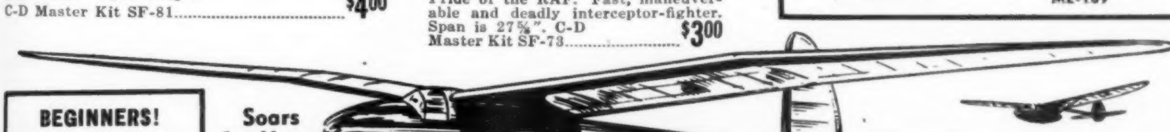

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vantageously to perform simple static tests upon model airplane fuselage structures. Refer to Fig. 7. The strength of glued joints in shear may be tested statically. All testing operations require that a preliminary mock-up be assembled and tested. While using a mock-up is laborious, simple tests will show the approximate strength of the model airplane structure. It is possible to test the bending characteristics of the fuselage structure as shown. When the weight of the structure is known, multiplication by a load factor of 4 equals the factor of safety for the structure. The scale indication may be used to determine if the structure complies with the load requirements.

Stiffening of Bulkheads

On many model airplanes, the tendency to use solid bulkheads has been prevalent. In the interest of design, these bulkheads must be of sufficient thickness to resist local buckling. In order to conserve weight and yet at the same time provide the necessary strength, the use of a light balsa or plywood sheet is possible, stiffened by spruce stiffeners. The effective area of the stiffener is approximately 3 1/2 times the width of the stiffener, measured from the centerline of the stiffener on each side.

On a large solid bulkhead, where a system of multiple vertical stiffeners is used, the distance between the centerlines of the stiffeners should be approximately 7 times the width of the stiffener. This distance given between the stiffeners is the average that should be used, although the exigencies of design may alter this spacing. This type of bulkhead spacing is lighter in weight than a thick bulkhead and exhibits comparable strength to the thick bulkhead.

When a large cut out is used in the middle of a bulkhead, which is frequent practice in control line design, small stiffeners may be placed at the four edges of the cutout.

VICTORY

The Upstart

(Continued from page 13)

prop with shaft, BB washer and plug. Then glue left-handed prop very securely to tube.

VANES: Next make the vanes of 1/16" x 3/16" medium hard balsa, as they take a beating on every landing. Make three vanes and when dry cover them on one side only and do not shrink paper. Glue vanes to the correct length of aluminum tubing. When dry insert wire axle through tubing and affix to bottom plug on which you have already fastened back hook to take an "S" hook for winding. Give the props two coats of clear dope and the tube three coats. Make a ten-strand loop of 1/8" flat rubber, lubricate and install.

TESTING: We realize in this type of model there can be no glide or hope for thermals, thus the object to work toward is as long a power run as possible, coupled with correct pitch and power adjustments, for attaining the greatest possible altitude. When we speak of power adjustments we naturally mean the number, size and length of the rubber strands contained in the motor. The only adjustments possible will be either to decrease or increase pitch in the blades or increase or decrease the motive power. The only mal-adjustment that may creep into the model will be a violent lurching around under full power, which can be remedied by increasing the pitch in the bottom set of blades. When properly adjusted wind fully and watch the Upstart bore a hole in the nearest cumulus.

VICTORY

Power Kite

(Continued from page 23)

in turn, is cemented onto the motor stick. (One or two wisely stuck pins will keep it steady till the adhesive dries.)

Slide the propeller shaft onto the thrust-bearing, using two washers between bearing surface and prop. Cement the can at the stabilizer L.E. Attach the rubber motor (an 11" loop of 3/16" brown rubber) to the prop shaft, and by means of the S hook, to its rear anchorage.

If the wing clips have been properly formed they will slide firmly into position and stay there. If the clips tend to come loose apply a coat of cement where they clasp the motor stick, after balancing the model. To balance, glide the model from your hand. If it dives, mount the wing further toward the propeller. If the model stalls and pancakes to a landing, move the wing towards the rear.

For long flights, lubricate the motor and use a winder. The S hook is attached to the winder and the propeller shaft is held near the thrust-bearing. The model is wound from the rear.

You'll find this little "jeep" lots of fun.

VICTORY

WHAT DO YOU LIKE BEST IN THIS ISSUE?

We are anxious to publish the features *you* want to read. Drop the Editor a line.

Consolidated B-24

(Continued from page 19)

Larry Bell commenced work on contracts for Consolidated wing panels and engineering work on radical new type combat planes later to be known as the *Airacuda*, *Airacobra* and *Airabonita*.

Redesignated the PBY-1, the record-breaking flyingboat went into quantity production in San Diego and, as the Catalina patrol-bomber, it is still being built in large quantities for both U.S. and British Navies.

The PB2Y-1 followed, a four-engine version of the popular PBY's and today, as the Coronado, is used widely by the Navy as a cargo carrier and anti-submarine patrol plane.

The next design represented a truly radical step in aeronautics, for Mr. David R. Davis came into the Consolidated picture with his mysterious airfoil. An abnormally high-lift section, it can be used at lower angles of attack, thereby saving considerable drag losses which lower cruising range and run up operation costs of airplanes. The Consolidated Model 31 (September, 1939 issue) was designed from its inception around this new Davis airfoil and, at the request of Major Fleet, the retractable wing-tip float device, popularized on the PBY and PB2Y, was omitted so that test data might be used for the design of a landplane, which later proved the case. For the Model 31, although now in production for the Navy as the P4Y-1 patrol plane, was fundamentally a test ship for the bomber that was to follow.

The Model 32 was undertaken in 1938 and details were submitted to the Army, resulting in an experimental contract being let in January, 1939. In less than a year the Model 32, designated by the Army XB-24, was completed and took off for the first time on December 30th, 1939. The Davis wing proved every claim of its owner and, together with Consolidated engineers, a near-perfect plane resulted, for the XB-24 soon exceeded every expectation of the Army and quantity contracts were let. Production was undertaken in the Fall of 1940 and many thousands are now in action throughout the world under the name Consolidated *Liberator*, our Plane on the Cover this month.

The wing uses the Davis airfoil out to the tips where it merges into a conventional NACA reflex section to reduce tip losses. As for details of the Davis airfoil outline, it follows a smooth, concave outline along the upper surface. However, the lower surface has a generated reflex curve aft of the rear spar location. Its great thickness at the quarter-point permits use of heavy box spars. This permits extremely high aspect ratio of 11.5 and wing loading of almost 50 lbs./sq. ft. The two spars are built up on full cantilever box beams with engine mounts of heat-treated welded steel tubing bolted to the front spar.

Power is supplied by Pratt & Whitney *Twin Wasp* engines of various types in the several B-24 models described below. The experimental model was powered by Model S3C4-G double-row radial air-

cooled motors developing 1100 horsepower at 2550 r.p.m. at 6,200 feet altitude and having 1200 hp. available for five minutes duration at takeoff at 2700 r.p.m. Two speed single-stage supercharging was used on the earlier models but the General Electric exhaust-driven turbine supercharger was installed on subsequent models. The oil coolers are located within the engine nacelles; air is provided by ducts located in the cowling leading edge. This gives them their odd elliptical shape.

Ailerons are all-metal construction, fabric covered. They are dynamically and statically balanced through the use of lead counterweights bolted into the leading edge. The flaps are Fowler type modified somewhat in the elimination of the extending tracks used on the earlier type.

The tricycle design landing gear employs a single small nose wheel and two large main wheels in each inner wing panel. The nose wheel retracts into the fuselage and the main gears fold outwards into the wing lower surface. No fairing is used to seal the opening due to the flush position of the gear upon retraction.

The B-24 fuselage is built in a series of subassemblies of conventional monocoque construction employing flanged 24ST formers, extruded channel-type stiffeners and hi-duty extruded longerons. This frame is covered with 24ST Alclad aluminum sheet flush riveted throughout. Consolidated is unique in that it manufactures its own rivets within the plant through arrangements with Aluminum Company of America.

The entire fuselage lower midsection is left open with the load carried by the beam type longerons to permit installation of bomb doors and racks. Two separate bomb bays are provided; bomb doors are the rolling type similar to old-fashioned roll-top desks.

The pilot and co-pilot are seated side-by-side atop the fuselage, forward of the wing. Complete navigation, flight and engine controls and instruments are provided. The radio operator and navigator are located behind the pilot and complete radio equipment is carried; several command sets for receiving and sending in code or voice, direction-finding loop, radio marker beacon receiver and interphone installations.

Entrance and exit is accomplished on the left side of the fuselage just aft of the wing trailing edge; emergency exits are located above the pilot's cockpit, within the fuselage and for the nose and tail gunners.

The first production model, the B-24A, consisted of extensive minor modifications to the experimental model. This model was also ordered in quantity of 120 by the French Armee de L'Air late in 1939 but the collapse of the French Army in 1940 caused the contract to be assumed by the British Purchasing Commission for the Royal Air Force. The B-24B was delivered to the R.A.F. as the *Liberator* I and was used by the Coastal Command as a long-range reconnaissance and bombardment plane. This version had a span of 110 feet, was 63 feet, 4 inches long and weighed 41,000 pounds fully loaded. It had a maximum speed of 280 m.p.h. at 16,000 ft. Armament consisted of movable .50-calibre machine guns located as follows: 1 nose, 2 waist, 1 belly, and 1 tail, or a total of 5 in all.

The B-24C featured addition of a power driven tail turret and was purchased by the British as the *Liberator* II. The length was increased to 66 feet and a special version, known as the LB-30A was assigned to Prime Minister Churchill as a personal transport.

The B-24D was characterized by addition of turbo supercharging, which had proved such a success on the Fortress types. The oil coolers were moved from the wing leading edge to the engine cowls and additional armament was provided in the nose and in the belly by the fitting of a power driven turret of the retractable type. The speed was increased to 290 m.p.h. at 25,000 ft. and the ceiling raised to 40,000 ft. This version is in service with the British as the Liberator III. It is known that some of these have been fitted with four 20 millimeter cannons fixed in a special fairing below the fuselage just aft of the nose wheel. This model was also purchased by the Navy, arousing considerable controversy, where it is known as the PB4Y-1. It was the B-24D that was modified into the C-87 *Liberator Express* which has a top speed of better than 300 mph and carries nearly 10 tons of cargo.

(Turn to page 52)

The B-24E features installation of a power driven nose turret bringing the total fire power to 10 machine-guns of .50-calibre. Bomb load is increased to 10 tons, the bomb bays accommodating 12,000 pounds and two 4,000-pound bombs were carried externally under the wings.

The B-24F and B-24G were minor modifications and the B-24H features relocation of the upper turret farther aft to a point just over the wings' trailing edge.

Later *Liberator* models, probably with heavy cannon, are now in service but all details are restricted.

The Consolidated *Liberator* is being used on all United Nations fronts and has carried out bombing missions over Germany and Italy, on Japanese Pacific bases, used on the Mediterranean front and in the attacks on Japanese-held bases

CLUB NEWS

Virginia

The Brain Busters Model Club of Hampton, Va., boasts a membership of over seventy-five of the top model builders who are continually bringing home the bacon.

A group of twenty-eight went to the Long Island Championships and really came through. In Class A gas, Karl Birkel received fourth and Charles Folk, fifth. In Class B. Frank Parmenter, club president, received first place. Second went to Joe Dodson, third to Sal Taibi, and fourth to Tom Abel. In Class C. Tex Weber, a former employee of N.A.C.A., received first place. In tow-line, Karl Birkel received second place.

Two weeks later another group went to the West Virginia State meet and really crashed through. Richard Sladek, club treasurer, received first place in the all class gas event and also second in rubber for fellows over twenty-one years. Bill Ramsey, Florida State champion in "41," received first in cabin and second in stick and sixth in tow-line glider for contestants under twenty-one. Other places won were Dick Everett, fourth, and Joe Boyle, seventh, in gas. Everett third and Boyle fifth in open rubber.

Two weeks later came the contest they had all been waiting for, The Brain Busters Model Seaplane Championships. It was a nice day with a slight breeze and just enough currents to give the gas jobs a boost and the rubber jobs some out of sight flights. Six new National records were established, quite a score for one contest. The prizes were something every model builder dreams of but seldom sees. First places won a subscription to MODEL AIRPLANE NEWS. Trophies, war bonds, cash and merchandise. The trophies were a real eye opener. The first place trophies being close to three feet tall, and the second places nothing to sneeze at. The trophy value alone was over $400. The results of the contest were as follows:

Class C gas:
First. Frank Parmenter, Oak Park, Ill. Class C Open record.
Second. Herb Andrews, Rock Island, Ill.
Third. George Sadler, St. Petersburg, Florida.

Class B Gas:
First. Karl Birkel. Freeport, Long Island, N.Y. Class B. Senior record.
Second. Charles Molisee, Detroit, Mich.
Third. Sal Taibi, Brooklyn, N.Y.

Class A gas:
First. Walter Kabana, Perth Amboy, New Jersey.
Second. Ralph Moscater, Brooklyn, N.Y.
Third. Karl Birkel, Freeport, Long Island.

Rubber:
First. Dick Everett, Wheeling, West Virginia. Class D Stick open record.
Second. Dick Sladek, Cicero, Ill. Class C Stick open record.

California

The East Bay Aeroneers, Oakland, Calif., held a Towline Glider Contest, Oct. 3, '43. The Hobby Shops of San Francisco and Oakland donated generously. Everyone entering received exceptional prizes. The contest was won by a newcomer, Bob Gustafson, flying a Thermic "50"; he caught one of the two good thermals of the day. Mr. Martin, on his first flight, lost his glider, going out of sight over head. The 5 min. limit was used because of the small field. Results of high times:

Bob Gustafson	334.8	seconds
Les Martin	300	"
Chas. Dorsett	168.2	"
Dean Montagne	159.2	"
Don Foote	148.8	"
Jack Dyer	129.	"
Andy Taglifacio	127.1	"
Paul Romak	125.	"

The E.B.A.A. 7th Monthly Contest was held Oct. 10, 1943. The day was extremely windy, contestants were not anxious to chance a "crack-up," but Buddy Romak's Westerner was flying perfectly so others agreed to fly. No Class "A" ships were flown except Jack Dyer's Atom Westerner. Rus Watkin's "B" Westerner and Milton Taylor's Dreadnaught "24" powered Zipper were running close. Mr. Martin won the "high time trophy" for the day, with his Thermie "36" powered Westerner.

Syd Kalison of the Connecticut Elm City Gas Bugs was a welcome guest and new member of the E.B.A. Syd had quite a time starting a motor and flying a ship after being in the Navy for two years without a look at a model.

1st and 2nd place results: (5 min. limit)

	Total Time
"C"	
Les Martin	12:50
Bud Romak	9:29
"B"	
Milton Taylor	7:43
Rus Watkins	6:57
"A"	
Jack Dyer	:30

Times were generally lower in this contest despite a slight increase of al-

tendance; however, the battery situation is becoming more and more critical and unless a source of fresh batteries is found, this trouble will persist. The contestants are becoming well acquainted and are looking forward to these contests more as get-togethers than as competition. Everyone helps one another out as much as possible and very few models completed their flights without borrowed parts.

The contest re-shuffled the team places which are now finally established before meeting the North American Club in the middle of the next month. Class A section of the team is unchanged and of course the Team Captain is still Vic Leroux. Leroux and Sowles climbed higher up in the Class B section, while Kilgore won a place for himself. The Class C section shifted, with Laurie now section leader and Hildebrand, Leroux, Taggart, Kilgore and Spain members in that order. The team is now at a high potential strength and should make a good showing in its first official test.

DISCUSSION

Rules vs. Thermals

By Ocie Randall

Having flown gas model planes from San Diego in the south to San Rafael in the north of the state of California and taking part in over 150 contests over a period since 1937, I have watched with interest the various conditions that prevail in and around the state of California.

Thermals in San Diego in the summer time are vicious, that is to say, planes in good thermals are almost certain to be lost.

Thermals around Pomona are not so bad but on occasion strong ones develop that will carry a plane away from the contestant. This also applies to the surrounding area adjacent to Pomona.

The thermals in Los Angeles are a modeler's idea of perfect flying conditions. They are what we call flat ones; that is, the plane will very seldom get out of sight in the blue but will fly long distances before breaking out of the thermal. However, the modeler must use a car for the long flights as there is usually a good breeze that will soon tire out a person on foot.

Thermals in all parts of the great San Joaquin valley are notorious for their severity. Far too many planes have been lost in Bakersfield, Taft, Coalinga, Hanford, Lemoore, Avenal, Porterville, Lindsay, Laton, Fresno, Modesto, Tracy, Gustine, Los Banos and Reedely. These towns took a very active part in contests during peace times. Fresno is the only one now holding monthly affairs.

Going farther north to the flying area of the East Bay Aeroneers around Oakland and San Francisco, thermals are of the traveling variety, and far too many planes were lost around there from not being able to stay with your plane for lack of roads and sometimes they were out of sight in the blue.

Around Sacramento the thermals are of the straight up type that usually just hold the plane in sight overhead for long

times. This is the country where my good friend, Don Foote, set the world's record in Class C, that I believe will stand for quite some time: 24 min., 37.5 seconds average of three flights.

The old A.M.A. rules mostly prevailed over the State in the past with few modifications. Basically, they were the same, wing loading, motor run, etc. Now there is a cry for more rules of all kinds, and of course the resulting holler is to be heard from all around. One of the much discussed rules contemplated is compulsory dethermalizers. In this respect I believe that when you tell a modeler what he has to have on his plane he will rebel and it will make an outlaw of him, by flying to himself and not attending contests. Some places, like Los Angeles, will never need dethermalizers, and so it is folly to try to compel them to use them. I believe that this item should be left up to the individual as to whether he wants to use them or not. I myself use them and like them. I think that the rules for contest flying should be just as simple as possible, as you and I know that *all* rules are violated in some respects. The managers of contests don't have the time to enforce a multitude of rules and most of them are too confusing anyway to the average modeler. In this respect I would say to classify planes by the motor size as at present, and abolish wing loading. WOW! Someone hollers, suppose some guy puts an Atom in a Sailplane for Class A? Well, if that guy could get a Sailplane high enough in say, 20 seconds, with an Atom, give him credit, not condemnation. Continue the 20-second rule for motor run. Let conditions ascertain the flight time, whether limited or unlimited. Get it straight once and for all what is a voided delayed and an unofficial flight. In this respect I suggest one extra flight in case the flight is under 40 seconds or the motor run is over. I also like three flights and total the time in seconds. If the plane fails to rise off the ground, it is under 40 seconds naturally, so he should have one more try. I believe in the rise off ground rule if conditions permit. Otherwise, hand launch. In case of ties, the shortest total motor run time would determine the winner.

There should be some way of entering a plane as a unit and have it identified as such and if it is injured in the contest it should be repaired or out of the contest. I mean, no borrowing of parts, such as wings or tails, but of course this is going to be hard to enforce. Give the boy credit who fixes his plane up after an accident so that it will fly again. He invariably uses some very clever short cuts to get it in the air again.

New Jersey

Model Airplane Meet at Perth Amboy, N.J., Sept. 5, 1943

One of the largest groups of aero modelers to assemble in the East this year participated in the first annual model airplane meet sponsored by the Department of Parks and Playgrounds and the Perth Amboy Aero Club Sunday afternoon at Garretson's Field.

Despite threatening weather, boys and men from all parts of New Jersey and New York were on hand to take part, which is destined to become an annual affair. Prizes totaling $217 were distributed to the winners, but the Lieut. John E. Petach Memorial Trophy was the most cherished of all.

The Petach Memorial Trophy, annually awarded to the P. A. Aero Club Champ was won by Norman Kubinak, Major "Bill" Garretson of the Eastern Air Command made this presentation. Other prizes were distributed by Charles T. Kochek, supervisor of the City Recreation Department.

Commissioner Joseph P. Sieber of the Dept. of Parks and Playgrounds was a visitor and announced that plans would be made to conduct the races in Perth Amboy annually.

Results were:

Lt. John E. Petach Memorial Trophy—Norman Kubinak, Perth Amboy, N.J.

Sr. H. L. Glider Class A—John Rogusky Jr., New Brunswick, 1 min. 23 sec.

Jr. H. L. Glider Class A—Gregory Higgens, Newark, 38 sec.

Sr. H. L. Glider Class B1—John Rogusky Jr., New Brunswick, N. J., 1 min. 5-3/4 sec.

Jr. H. L. Glider Class B1—Gregory Higgens, Newark, N.J., 1 min.

Sr. T. L. Glider Class C1—John Nuszer, Bronx, N.Y., 4 min. 31 sec.

Jr. T. L. Glider Class C1—Bob Smith, Orange, N.J., 1 min. 17 sec.

Sr. T. L. Glider Class D1—George McLafferty, Staten Island, N.Y., 2 min. 15 sec.

Jr. T. L. Glider Class D1—Gregory Higgens, Newark, N.J., 1 min. 26-4/5 sec.

Lt. John E. Petach Memorial Trophy: Norman Kubinak, Perth Amboy, N.J. Sr. H.L. Glider Class A: John Rogusky Jr., 1 min. 23 sec.; Jr. Class: Gregory Higgens, 38 sec. Sr. H.L. Glider Class B: John Rogusky Jr., 1 min. 5-3/4 sec.; Jr. Class: Gregory Higgens, 1 min. Sr. T.L. Glider Class C: John Nuszer, 4 min. 31 sec.; Jr. Class: Bob Smith, 1 min. 17 sec. Sr. T.L. Glider Class D: George McLafferty, 2 min. 15 sec.; Jr. Class: Gregory Higgens, 1 min. 26-4/5 sec. Sr. Fuselage Class C: William Grahame, 2 min. 38-3/5 sec.; Jr. Class: Jerry Eberling, 3 min. 30 sec. Sr. Fuselage Class D: Bert Busch, 1 min. 15 sec. Sr. Stick Class C: Wm. Grahame, 1 min. 33 sec.; Jr. Class: Mark Teany, 2 min. 5 sec. Sr. Stick Class D: John Gluth, 6 min. 19 sec.; Jr. Class: Otto Oswald, 45 sec. Speed U-Control: Paul Spraull, 45 miles per hour.

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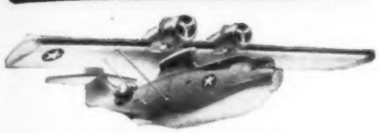

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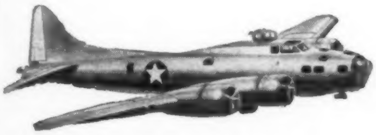

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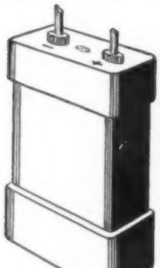

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LOCKHEED P-38
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said the pilots after taking this "forked vengeance" into the stratosphere. No home complete without one. 1/4" Scale Solid.

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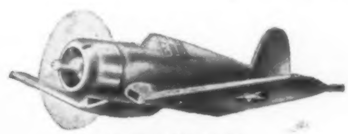

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VAUGHT NAVY CORSAIR

The sweetheart of the flat-tops. Can stand, turn around and come down on a dime.

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Modelcraft

The Largest Supply House in the West

7306 So. Vermont Ave. Los Angeles 44, California

The "Flying Tiger"

(Continued from page 9)

bolt holes through the motor bearers to fit your motor. A small metal plate is fastened to the bearers at this point with a wood screw to which the motor bolt nuts are soldered. Now cement the small balsa cowl blocks around the bearers and carve to shape. The battery box is built up from plywood to dimensions shown, cemented to the ignition track, and fastened to the cowl with a metal clip and two 4-32 bolts. Cut out the cowl planking to take your gas tank and dope the inside well. When dry install your motor and finish the wiring.

FINISHING: The model is completely covered with a good grade of covering material and doped well. The original had five coats of wood filler and five of dope. If you sand between the coats of filler with fine sandpaper and rub out the coats of dope you will obtain a very beautiful finish that will add mph to your ship.

The final step is to install the 1/16" wire external control rod from the bellcrank to the elevator horn and check to see that the controls are perfectly free.

FLYING: You will find this to be a very easy model to handle in all sorts of weather; but as with all models a calm gives you the best flights. Get your flying equipment together, which should include 50 ft. lines of No. 2 piano wire as well as your control stick, and find yourself a good smooth spot. The motor should be checked well before flying and operated at one-half throttle until you obtain the feel of your model. Experience has shown that a down-wind take off helps prevent the model from climbing too fast at first, so bear it in mind and have many happy landings!

VICTORY

SKYWRITERS

SKY MASTER by Frank Cunningham—Dorrance and Co., Philadelphia, Pa. (321 pages) $3.00.

Donald Douglas was building and flying models when Professor Langley was working on his Aerodrome and the Wright Brothers were experimenting with their gliders. And he has been a pioneer ever since with his voluminous output of airplanes, from tiny fighter and training planes to giant four-engined monster. He has designed airplanes that were the first to fly around the world. His name has become legend and today he heads the largest aircraft company in the entire world with branches spread across the face of the globe. This is the story of Donald Douglas' career, from the early Martin training machines to the present world-famous craft bearing his name. The book is complete in every detail and replete with photographs. It is one of the first truly complete biographies of world-famous aircraft personalities.

SMOKE STREAMS, by C. Townsend Ludington—Coward-McCann, New York City. (144 pages, 125 photographs) $2.75.

Theory is a difficult thing to understand and the theory of airflow is normally beyond the graphic comprehension of even the trained engineer. But here, for the first time, the reader is enabled to see aerodynamic theory in action through the use of the famed Griswold Smoke Tunnel, which has opened the way for the study of airflow through "smoke" pictures. In this little volume, the Assistant Director of Franklin Institute has taken, edited and presented photographs of the airflow around a large variety of airfoils in an equally large variety of different positions and various forms of high lift devices. For the serious student of airflow, this book is a must and it is equally interesting to the layman.

AIR NAVIGATION by P. V. H. Weems—McGraw-Hill, New York City. (406 pages) $5.00.

P. V. H. Weems, formerly a Lieutenant Commander in the Navy, has become the world's outstanding authority on aerial navigation and his name, truly, has become synonymous with that subject. In this large, carefully prepared work, Weems has prepared a thorough text book of the subject suitable for use in any course of instruction in the country, from pre-flight schools to regular four-year college courses. The subject is covered completely from an introduction to the earth to the use of charts, equipment and tables.

CHEMISTRY AND THE AEROPLANE by Vernon J. Clancey—Ronald Press, New York City. (176 pages) $2.25.

This badly needed little volume links two of the most widely developed sci-

ences in modern times together in a well knit expose of the many secrets which, allied together, have made modern aviation possible. It is amazingly complete and deals thoroughly with such subjects as fuels, metals, plastic, gases, etc. A highly enjoyable treatise which is equally useful to the practicing engineer.

JANE'S ALL THE WORLD'S AIRCRAFT—1942. Edited by Leonard Bridgman—The Macmillan Co., New York City. $19.00

The 1942 edition of this, the most famous of authoritative aviation reference volumes, has been compiled with all the completeness and fullness of the previous issues in spite of wartime restrictions of censorship, paper and mailing. Through arrangements with Sampson-Low in England, the 1941 and 1942 volumes have been printed in the United States by Macmillan which assures a much larger supply and vastly improved mailing speed. The Historical Section contains a complete resume of the war in the air to-date and reveals much information which has been hitherto restricted concerning the types of planes participating in the various actions described. The latest available photographs and data are included on German, British and United States airplanes and air forces and, of particular interest, is the expansion of the Japanese sections of the book. Certainly no aviation desk dares be without "Jane's" in the latest edition for quick, complete and accurate reference on the vast subject of airplanes.

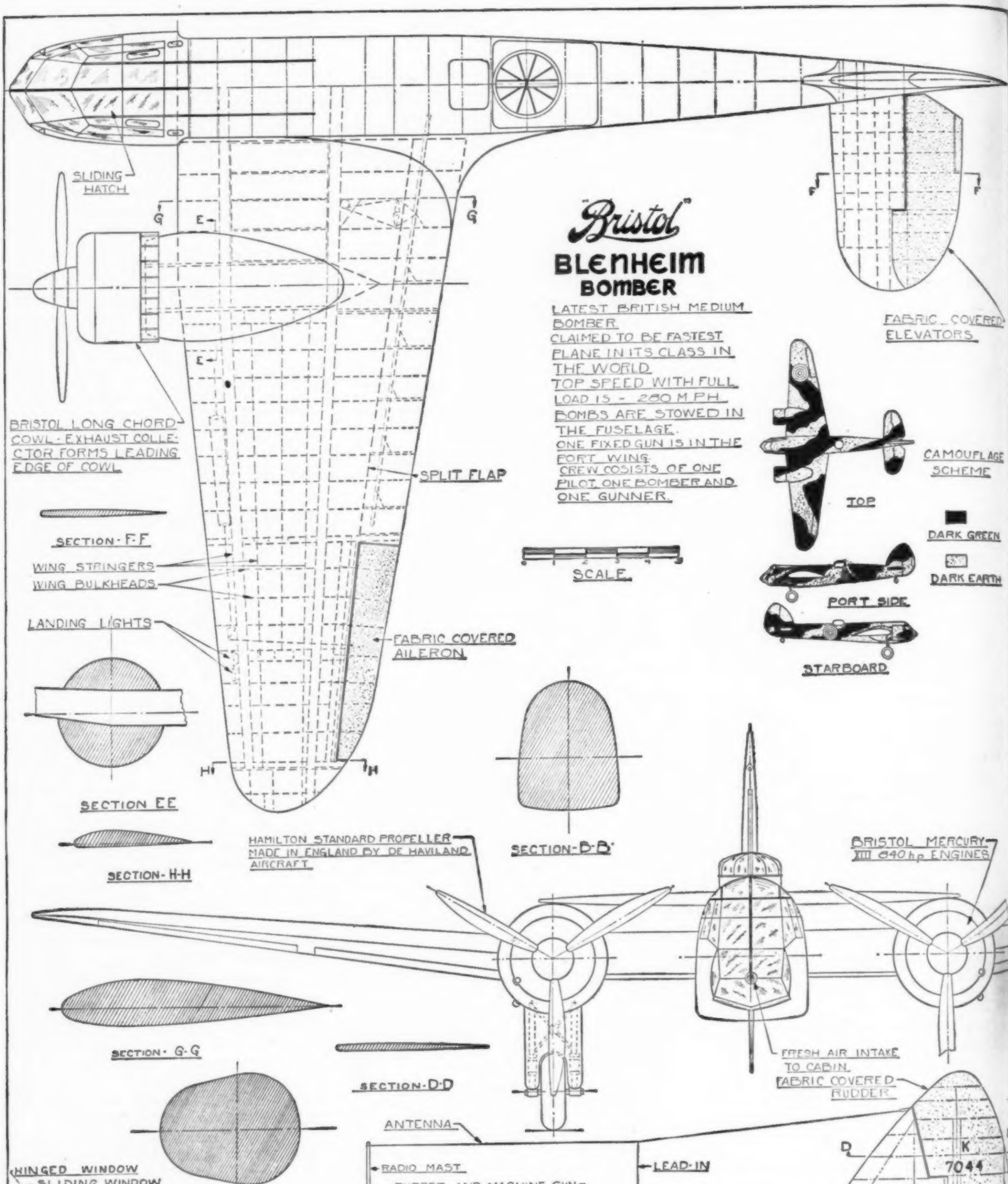
JANE'S ALL THE WORLD'S FIGHTING SHIPS—1942. Edited by Francis E. McMurtrie—The Macmillan Co., New York City. $19.00

This companion volume to AIRCRAFT is the outstanding world authority of warships of all the fleets and has, since the turn of the century, maintained its supreme standing in the field. Of particular interest is the section on war losses in which the name, details of sinking and date are given for each vessel lost in this war. Photographs and complete technical data are given for all warships now afloat as well as many now under construction and yet to be built. Censorship has not affected FIGHTING SHIPS and it is complete in every detail. The information on carrier ships of the world's navies is invaluable to the aviation reader.

HOW OUR ARMY GREW WINGS by Chandler and Lahm. The Ronald Press Co., New York City. $3.75

No student of aviation dares think of himself as an expert until he has read of the sacrifice, experiment, failure and success which marked American aviation from its inception with the Wright Brother's first flight on Dec. 17, 1903 to the outbreak of the first World War in 1914. Brigadier General Frank P. Lahm, the first Army pilot and Colonel Charles deForest Chandler, first to fire a machine-gun from an airplane are the two best possible sources of this information and in this book the complete story is set down for the first time. Never in aviation has such a short period produced so much history for nearly everything attempted turned out to be a "first" in aviation. Seldom has such a book been crammed full of authentic facts, data and references with names, dates and places of those historic years outlined in full. Lahm of these pioneer officers is now on the retired list and it seems likely that this first product will be followed by other historic volumes.

(Continued on page 63)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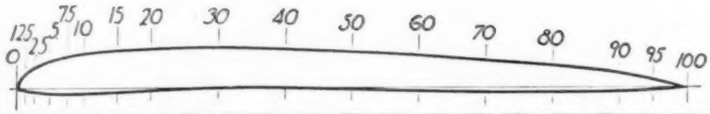
SPLIT FLAP
SECTION-F-F
WING STRINGERS
WING BULKHEADS
LANDING LIGHTS
FABRIC COVERED AILERON
SECTION EE
SECTION-H-H
SCALE
FABRIC COVERED ELEVATORS
CAMOUFLAGE SCHEME
TOP
DARK GREEN
DARK EARTH
PORT SIDE
STARBOARD
SECTION-B-B
HAMILTON STANDARD PROPELLER MADE IN ENGLAND BY DE HAVILAND AIRCRAFT
BRISTOL MERCURY XIII 840 hp ENGINES
SECTION-G-G
SECTION-D-D
FRESH AIR INTAKE TO CABIN
FABRIC COVERED RUDDER
ANTENNA
RADIO MAST
LEAD-IN
HINGED WINDOW
SLIDING WINDOW
SECTION-A-A
TURRET AND MACHINE GUN
K 7044
K-7044
RETRACTABLE TAIL WHEEL
BULKHEADS
STRINGERS
COWL FLAPS
RETRACTABLE LANDING GEAR
LOCKHEED OLEO & RETRACTING STRUTS
AIRSPEED PITOT TUBE
DUNLOP TIRES
SECTION-C-C
D. MERTENS

U.S.A. AIRFOIL SECTIONS

USA 16



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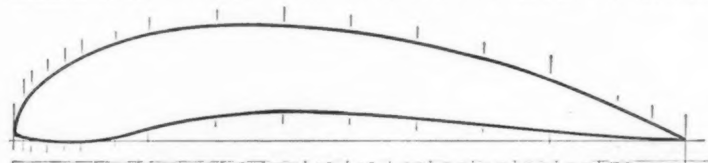
UPPER	0	2.1	2.99	3.88	4.52	4.95	5.42	5.67	5.86	5.74	5.29	4.65	4.01	3.25	2.23	1.37	0
LOWER	0	-.42	-.64	-.76	-.83	-.83	-.76	-.51	-.06	0	-.19	-.70	-.76	-.70	-.45	-.27	0

USA 31



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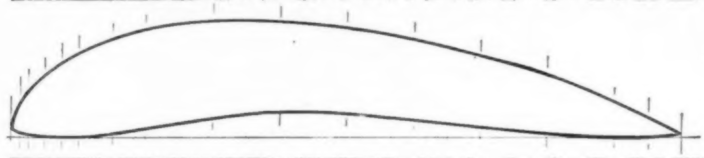
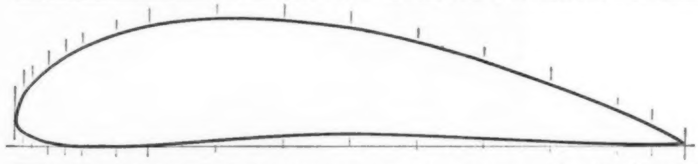
UPPER	1.0	5.4	7.1	9.5	11.1	12.4	14.3	15.6	16.9	16.9	16.0	14.3	12.0	8.9	4.9	2.4	.20
LOWER	1.0	.50	.30	.10	0	0	.60	1.7	3.6	4.4	4.1	3.4	2.5	1.5	.60	.20	.20

USA 32



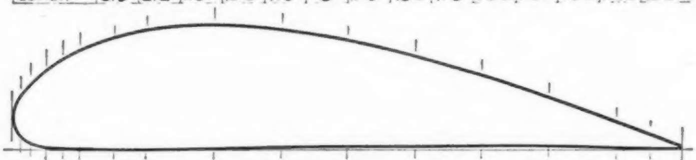
STATION	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
UPPER	1.0	5.4	7.1	9.5	11.1	12.4	14.3	15.7	17.0	17.0	16.1	14.3	12.2	9.1	5.2	3.0	.40
LOWER	1.0	.50	.30	.10	0	0	.30	1.0	2.6	3.8	3.4	2.6	1.3	.30	0	.10	.40

USA 34



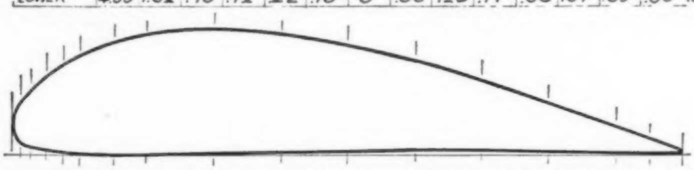
STATION	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
UPPER	3.3	8.0	9.6	11.8	13.3	14.6	16.4	17.7	19.0	18.8	17.5	15.5	12.5	9.0	5.2	3.1	.50
LOWER	3.3	2.2	1.5	.50	.15	0	.10	.30	1.0	1.50	1.60	1.50	1.20	.80	.40	.20	.50

USA 35



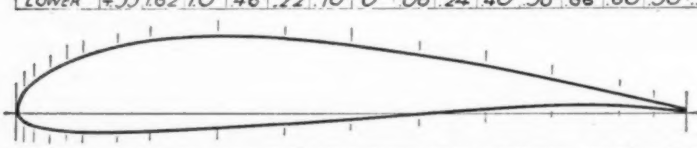
STATION	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
UPPER	4.33	8.09	9.58	11.83	13.58	14.88	16.6	17.72	18.43	17.86	16.16	13.91	11.12	7.88	4.33	2.39	.43
LOWER	4.33	1.62	.95	.42	.22	.10	0	.08	.25	.44	.60	.67	.65	.55	.32	.19	0

USA 35A



STATION	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
UPPER	4.33	8.09	9.54	11.81	13.51	14.85	16.6	17.73	18.46	17.89	16.23	13.83	11.11	7.88	4.31	2.39	.43
LOWER	4.33	1.62	1.0	.46	.22	.10	0	.08	.24	.40	.58	.66	.60	.50	.32	.19	.0

U.S.A. 40



STATION	0	1.25	2.5	5	7.5	10	15	20	30	40	50	60	70	80	90	95	100
UPPER	.40	3.03	4.07	6.03	7.27	8.3	9.76	10.6	11.12	10.76	9.9	8.57	6.97	5.07	2.93	1.77	.47
LOWER	.40	-1.5	-2.0	-2.47	-2.67	-2.8	-2.86	-2.67	-2.2	-1.56	-.90	-.17	.60	1.17	1.07	.73	.37

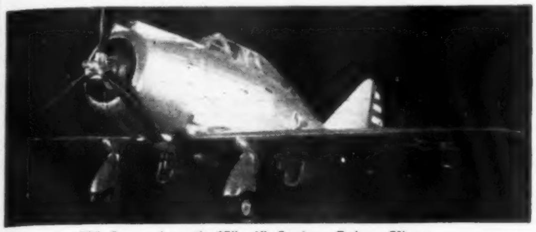
W DOMBERT

GRUMMAN F3F1
U. S. NAVY SHIPBOARD FIGHTER

32" Span. Length 24". 1" Scale

A fine detailed model with retractable landing gear, 4" turned motor front, 3 oz. grey dope, ½ oz. yellow, 2 oz. glue etc., all parts printed, 10" propeller, wheels, full size drawing, and all parts. This fighter plane is used in large numbers on the aircraft carriers. Const. Set complete........ **$3.75**

SEVERSKY P35A ARMY PURSUIT



32" Span. Length 25". 1" Scale. Color, Silver

Set has 4" turned motor front, 10" carved prop, wheels, tail wheel, all parts printed, 3 oz. grey dope, ½ oz. black, 2 oz. glue, etc., insignia, and full size scale drawing. New improved model has retractable landing gear and movable controls from cockpit. Set........ **$3.25**

CURTISS P36A ARMY FIGHTER

37" Span. Length 27". 1" Scale

A very strong model. Can be converted to gas motored control line type, using A or B Class motor. Set has turned 4" motor front, paints, and all parts. Set........ **$4.00**

BELL P39 AIRACOBRA U. S. ARMY FIGHTER

34" Span. Length 29". 1" Scale

New fighter to scale, parts printed, paints, glue, etc., wheels and all parts. Set........ **$3.50**

CATALOG No. 9

New large photos of the world's finest scale models. Send 10c coin.

ORDERING INSTRUCTIONS

Add 15c to each set for postage and packing charges.

NEW TAYLORCRAFT SPORTPLANE

36" Span. Length 22". 1" Scale. Weight 2 oz.

COMBINATION LAND AND SEAPLANE SET

A beautiful exact scale flying model with unusual flying range, so light it will rise from land in 6 feet. Const. set contains all parts printed, hardwood wheels, 2 oz. white dope, ½ oz. black glue, full sized scale drawing and all parts to build. Set........ **$1.50**

BOEING B-17 FLYING FORTRESS BOMBER

44" Span. Length 30". Color Silver. Weight 6 oz.

THE MOST SENSATIONAL EXCLUSIVE BOMBER SET IN THE WORLD

Set has all parts printed, four 2" special finished motor fronts, wheels, set of paints, glue and full size drawing. Set........ **$4.50**

CURTISS HAWK F11C4 NAVY PURSUIT

32½" Span. Length 22¾". 1" Scale. Color grey, top wing yellow

THE MOST EXCLUSIVE AND FINEST MODEL IN THE WORLD. MOVABLE CONTROLS WORK FROM COCKPIT. One of the most beautiful models ever made. Set has all parts printed, insignia, instrument board, step plates, ready cut wheel pants, 6 oz. colored paints, glue, large full sized drawing, turned wheels, and all parts. Const. set........ **$4.50**

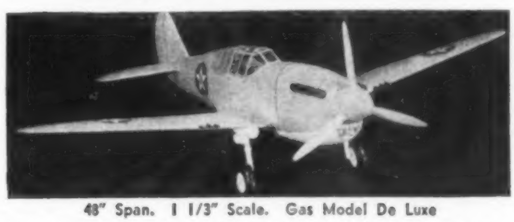
NEW MARTIN B26 U. S. ARMY BOMBER

40" Span. Length 35". ⅝" Scale. Color Silver

A beautiful model of the world's fastest bomber. Set has all parts printed, propellers, wheels, insignia, 4 oz. grey paint, 1 oz. black, motor fronts full size scale drawing, and all parts to build. Construction set........ **$4.75**

Thousands of this type of plane are fighting for the U. S. and Britain

CURTISS P40F WARHAWK GAS MODEL



48" Span. 1 1/3" Scale. Gas Model De Luxe

One of the strongest models ever made. Model has planked balsa body formers, ribs, etc., all parts printed on balsa, spinner, insignia, glue, clear dope, full size drawing, and all parts. Model uses either "B" or "C" class gas motor. "U" control or free flight. Set, without motor........ **$9.00**

BOEING F4B4 NAVY FIGHTER

22½" Span. Length 14½". ¾" Scale

A finely detailed model. Set has all parts printed, wheels, insignia, set of colored paints, full size drawing, and all parts. Set........ **$2.95**

NOTE: All photos in this ad are actual unretouched photographs of our flying type scale models. We do not show sketches or photos of real planes. Know what you are getting. Buy the world's finest models as shown here.

MINIATURE AIRCRAFT CORP.
83 DANIEL LOW TERRACE STATEN ISLAND, N. Y.

Flash News

(Continued from page 2)

Hellcat and *Avenger* test pilots . . . and Russian women are now ferrying bombers from Alaska. . . . Imperial Oil of Canada claims that its new *triptane* is so powerful an aviation fuel that no engine yet built could take it.

COMBAT EXPERIENCE dictated the design of our two, new, soon-to-be-seen fighters, says Asst. Secy. of War Lovett. . . . Budd, shiny railroadcar builder, has just polished off a new stainless steel twin-engine transport for the Navy. New plane is powered by P&W, carries 9,000 lbs. of freight for 600 miles or 5,000 miles with extra fuel tanks. . . . A new electronic device, the ceilometer, gives meteorologists an accurate day and night ceiling, replacing theodolites and balloons which were often 40% wrong. . . . The Royal Navy has welcomed British versions of the *Corsair, Avenger* and *Hellcat* combat planes into service. . . . The newest P&W engine provides a terrific burst of sudden power with a new water injection device—watered fuel is amazing when it's done right! . . . Uncle Sam clipped the wings of 13,500 flying Japs between Pearl Harbor and Tarawa. . . . Unleashed bombers cannot be used in Italy because of the possible toll of Italian civilians—but military targets are given no rest.

FAR FROM BEING down and out in this war, the ancient Consolidated *Catalina* flying boat (and amphibian) has emerged in a new and powerful role: night combat. Special equipment has made this venerable giant a newer, deadlier addition in Pacific bombardment at night. . . . North African Air Force has cost the *Luftwaffe* nearly 6,000 planes against a loss of around 1,500 to the Allies. . . . Air Transport planes within the continental limits of the United States are scheduled to doff their heavy, ugly coats of olive drab. Removal of the 420 lbs. of paint on a Douglas transport will add that much to the payload. Consolidated Vultee's Vultee Field Division (Downey, Calif.) is now hard at work on Lockheed P-38 sub-assemblies (wing sections, etc.) and when the giant firm's Nashville Division finishes up work on the Vengeance contract, it too will assist Lockheed in P-38 production.

R.A.F.'s TYPHOON now mounts droppable auxiliary fuel thanks made from paper. The paper is wrapped around a form and impregnated with animal glue and gelatine and the finished product is liquid-proof, light and highly inexpensive. . . . The Japanese announce three new types: the Shoki fighter, the Donryu long-range bomber and the Shitei reconnaissance plane, all of which are claimed to be in active service in the South Pacific. No news of these planes has been reported by the War or Navy Departments of the U.S. . . . Reports by observers indicate that the Germans are making preparations for the evacuation of the Island of Crete, largest and most strategic in the Eastern Mediterranean. Reason for the possible move is that strong air defenses cannot be provided when the Allied attack comes for the Luftwaffe now has only 200 airplanes for the defense of the entire Balkans! . . . First photographs of the mysterious Australian *Boomerang* fighter, developed by Commonwealth Aircraft, reveal it is being merely a cleaned-up version of the well-known North American NA-50 single-seat pursuit a later model of which is known as the P-64 in the A.A.F. . . . R.A.F. Fairey *Battle*, in quantity production in Canada, is fitted with an American Wright *Cyclone* radial air-cooled engine, replacing the famed Merlin, production of which is going elsewhere.

MORE NEWS on the Royal Navy's new *Baracuda* torpedo-bomber; it is a product of Fairey and is powered by the popular Rolls-Royce *Merlin* engine. The U.S. Navy does not use liquid-cooled engines in its planes. . . . Japanese Mitsubishi *Zero* in the latest version, has sharply square-cut wings in imitation of highly successful Grumman *Hellcat*. . . .

VICTORY

AIRCRAFT MATHEMATICS by Walling and Hill—The Macmillan Company, New York City. $1.75

The little volume was prepared first in 1941 for use as a textbook for students of the Air Training Corps preparing for entrance into the Royal Air Force by S. A. Walling of the Royal Navy. It was such a success that recently an American edition was produced which involved a revision of the book to conform with American aviation terminology. The purpose of the book is a very fast brush-up course in arithmetic, algebra, geometry, logarithms and trigonometry with all non-essential eliminated and including nearly 600 problems with answers for checking purposes. When an aviation career is contemplated the student could make no better move than to pore through this volume for a few nights in preparation for the Army or Navy examinations.

THE WRIGHT BROTHERS by Fred C. Kelly—Harcourt, Brace and Co., New York City. $3.50

Seldom has there lived a more modest man than Orville Wright, the surviving brother of the famous team. There is little of his writings available and it is almost an impossibility to enveigle him into speaking. At the huge ceremony in his behalf in Washington, D.C., on December 17, 1943, commemorating the fortieth anniversary of flight in which such distinguished personages as General Arnold, Admiral King, Secretary Knox, Jesse Jones, Glenn L. Martin, Lawrence Bell, Grover Loening, etc., participated, Orville Wright's modesty forbade his speaking. And so it is an extremely rare treat to have a book which is fully authorized by him and the manuscript of which he checked and corrected for accuracy of details. Fred Kelly has given us the first truly complete and authoritative account of the lives and accomplishments of the Wright Brothers and it may well be the only one, and it was only his long and close friendship with Orville Wright that made this book possible. It is completely illustrated and amazingly well documented. It is the only thing of its kind on the subject and will, in time, become a treasure for aviation history students.

AIRCRAFT ELECTRICAL ENGINEERING, by Randolph Matson—McGraw-Hill Book Company, $3.50.

Aviation for forty years has largely been a collection of allied sciences and the terminology, data and mathematics of aviation has always been of a second-hand nature. In the last few years on a progressive scale there has been building up a science of aviation in which problems peculiar to aviation have been handled as such. Mr. Matson has given us this volume on the subject of aircraft electrical engineering complete and distinct from other forms of electrical engineering. Thus, the problem of the electrical designer in aviation is vastly simplified, for only the aeronautical aspects of the subject need be surveyed in answer to a problem. Of particular interest in the lateness of this book for the most modern developments in aircraft electric motors, power supplies, radio equipment and instruments are included. This book is a necessity for the engineer's library and the student will find it a particularly valuable reference work.

COMBAT AVIATION by Keith Ayling—Military Service Publishing Co., Harrisburg, Penn. $2.00.

It is a rare occasion when civilian enthusiasts have access to military details on so exciting a subject as aerial fighting, but Keith Ayling has drawn upon his experiences, his acquaintances and his studies to produce an outstanding volume. Although written expressly for the combat pilot, the non-technical nature of the subject renders it entertaining and highly informative reading for the layman. The book covers such subjects as formation and single combat, gunnery, interception and night combat. It is replete with diagrams and photographs and is a veritable maze of detailed analysis and exposition on this thrilling subject.

AIRCRAFT POWER PLANTS by Arthur P. Fraas—McGraw-Hill Book Company, New York City. $4.50

It was recently determined that improvements in aircraft engines and power plants has accounted for nearly 40% of the improvement in aircraft performance. Thus, the growing importance of aircraft power plant design and operation has resulted in a standard reference work on the subject and Mr. Fraas of New York University has done a splendid job on a highly complex subject. It was fortunate that he chose the general subject of the power plant for, although there are many very good texts on the aircraft engine alone, it is the fuel and oil systems, supercharging mechanisms and acessories that permit the aircraft engine to perform its job efficiently. Mr. Fraas' presentation of such complicated subjects as combustion, carburetion and fuels and lubricants while authoritative is simple and easily understandable and for the student and designer alike this volume should serve as a handy reference and instructional text.

MATHEMATICS OF FLIGHT by James Naidich—McGraw-Hill Book Company, New York City. $2.75

The title of this book may be slightly misleading until the book is studied and then it aptly sums up the amazing scope of the volume. That there is a mathematics of flight no experienced designer will doubt and he is extremely fortunate in having in a single reference work the complete collection of mathematical principles peculiar to aeronautical engineering. The principles of flight are completely covered in such chapters as center of gravity, stability and control, lift, level flight, climbing, gliding and turning, so it is obvious that this is no pure mathematics book but one containing a complete expose of aeronautical principles as well. For the aeronautical engineer it might be well that this text be used for school courses in mathematics rather than the standard texts for then the subject will be intimately tied in with his later classes on flight theory.

AIRCRAFT HANDBOOK by Fred H. Colvin—McGraw-Hill Book Company, New York City. $5.00

Certainly no engineer needs an introduction to this famous work which was first published in 1917 and now in its fifth edition. Originally written as a maintenance handbook it has been repeatedly enlarged and improved until this new edition makes it everything that its title implies: a complete aircraft handbook. Seldom has the civilian had access to so complete an analysis of aircraft engines and equipment with unbelievably complete data on the Allison, Twin Wasp, Rolls-Royce Merlin, etc. There is similar data on magnetos, propellers and instruments; no aircraft repairman or mechanic should be without this reference book.

Mr. Colvin is equally famed for his well-known AMERICAN MACHINIST'S HANDBOOK and many other books on machine tools, their operation and care. He brings to the aviation field a long engineering background.

VICTORY

SORRY IF WE'RE LATE . . .

The war is taxing the nation's transportation facilities to the limit, and there will undoubtedly be delays in the delivery of your copies of Model Airplane News. We regret the inconvenience to you, but this is a matter entirely beyond our control.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